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FACULTY CONCERNS AND PERCEPTIONS OF MANDATED EDUCATIONAL CHANGE: AN EXPLORATORY STUDY

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FACULTY CONCERNS AND PERCEPTIONS OF MANDATED EDUCATIONAL CHANGE: AN EXPLORATORY STUDY

by

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Dedication

For the greatest family:

Mónica, my dear wife, and our beloved kids: María, Carlos Enrique and José Luis, for being part of this amazing journey to get "our" doctorate!

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Faculty Concerns and Perceptions of Mandated Educational Change: An Exploratory Study

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The purpose of this study was to examine faculty concerns and perceptions of facilitators, barriers, and leadership interventions in implementing a mandated systemic educational change to the teaching-learning process—the ITESM Educational Model (MET)—at the Mexico City campus of the Monterrey Institute of Technology and Higher Education (ITESM), headquartered in Monterrey, Mexico.

This study relied largely on quantitative-based research methodologies. Research questions were assessed using multivariate analyses of variance in addition to secondary analyses of institutional qualitative data and documents, and

multinomial logistic regression. Participation in the study was voluntary. Data was collected from full-time and part-time faculty using a Web-based survey containing several Likert Scale-based instruments.

The study results indicated that faculty had significantly different perceptions of facilitators and barriers to implementing the MET when their work status, professional development/implementation level, and educational level were taken into consideration. The most important facilitators perceived by the faculty were institutional change culture, faculty academic background, students acceptance of change, and ongoing support and training. The most important barriers were support shortcomings and infrastructure operational problems. Results also surfaced that the present concerns of faculty were significantly related to their work status and extent of professional development. Finally, the study results indicated that faculty had significantly different perceptions of administrative leadership interventions facilitating the MET implementation when their work status, years of teaching at ITESM, and educational level were taken into consideration. The most important leadership interventions perceived by the faculty were ongoing support/coaching, providing resources and arrangements, and supportive change culture.

The study findings help provide a deeper level of understanding of what is facilitating and obstructing the systemic change process at each level of adoption of the MET and the type and level of faculty concerns related to this educational innovation. The study also helps identify the change management processes and leadership interventions necessary for new educational paradigm initiatives to succeed. Study results, while providing a clearer understanding of factors related to the mandated educational change faced by one specific institution, should also prove to be instructive to other institutions of higher education facing similar challenges.

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Chapter 1: Introduction

The purpose of this study was to analyze faculty concerns and perceptions of facilitators, barriers, and leadership interventions in implementing a mandated systemic educational change to the teaching-learning process—the ITESM Educational Model[1] (MET)—at the Mexico City campus of the Monterrey Institute of Technology and Higher Education (ITESM), headquartered in Monterrey, Mexico. This chapter provides a general context for the challenges for change in higher education in addition to a summarized description of the study. First, a broad overview and background of current change trends and challenges in higher education will be covered. The purpose of the study, identification of research questions and research methodology are subsequently addressed. A section on data collection and instrumentation is then provided, followed by the scope, limitations and significance of the study. Finally, a section containing some key definitions is included.

OVERVIEW AND BACKGROUND

Higher education has contributed to the development of societies throughout history. The higher education enterprise has shown its sustainability, adaptability, and transformative capability during the last 850 years. "Only in

[1] The ITESM Educational Model (MET) is a student-centered, technology-assisted teaching-learning process supported by specific didactic methods.

Europe from the twelfth century onwards did an autonomous, permanent, corporate institution of higher learning emerge and survive, in varying forms, down to the present day" (Perkin, 1997, p. 3).

Higher education has undergone a fundamental transformation from the Middle Ages and the Industrial Age to the current Information Age. As societies and businesses try to keep pace with the changes brought about by globalization[2] and technology[3], the need for skilled and flexible college graduates has risen substantially.

> Because of the importance of education to their competitive success, businesses are evaluating ever more critically whether college and university graduates are meeting their needs. Businesses and institutions of higher education must also evaluate what higher education can do to better prepare students for future careers in a constantly changing environment. (Broad in Oblinger & Verbille, 1998, p. vi)

Derek Bok (2003), former president of Harvard University, stressed that one important lesson universities might learn from businesses is the value of striving continuously to improve the quality of what they do. "Universities, too, need to learn and adapt more quickly; universities need to improve their teaching and educational programs" (pp. 25-26).

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[2] Globalization is a term used to define the current movement toward economic, financial, political, cultural and social integration on a worldwide scale, transcending national borders by creating greater access and exposure to opportunities, values, and products.

[3] Technology is defined as the practical application and use of computers, software, and other technical tools in commerce and industry.

Post-secondary institutions are currently challenged to undergo a radical transformation and renewal. Such transformation has been referred to as *The Learning Revolution* (Oblinger, 1997), and will take place in a new era of global digital[4] competition in higher education.

Banathy (1991) called attention to an increasing gap between education, with its relatively slow response to the need for change, and the rest of a rapidly changing society. As the world swiftly progresses to an increasingly information-based society, developments in technology are building momentum for radical educational change, from an information-dependent environment into one that is information-rich (Carter & O'Neill, 1995). With the appearance of the personal computer and other innovations of the Information Technology (IT) Age (e.g., networks, satellite communications, software, and the Internet) during the last 30 years, many institutions of higher learning are altering their teaching-learning processes. Technology and the traditional lecture-based teaching-learning approach are deeply challenging, and transforming colleges and universities worldwide. Change is required in the traditional teaching-learning process in order to train college graduates to fulfill new demands from society. In 1997, the American Council on Education (ACE) concluded that a wide chasm separates the academic and corporate worlds. The ACE's study highlighted the desired

[4] Digital describes electronic technology that generates, stores and processes data as a sequence of positive (1) and non-positive (0) binary symbols. It is used primarily with new physical communications media such as satellite and fiber optic transmissions.

attributes of college and university graduates. These attributes are summarized by the researcher from the ACE study, and shown in Table 1.

Table 1. Desired Attributes of College and University Graduates (Researcher's summary of attributes of the ACE study)

Desired attributes of college and university graduates
1. Systems perspective,
2. Problem-solving and decision-making,
3. Use of information technology,
4. Negotiation and teamwork,
5. Communication skills and multicultural awareness,
6. Adaptability and flexibility,
7. Creativity and leadership,
8. Analysis and synthesis, and
9. Willingness to learn from practical experience.

In order to promote the development of the ACE-identified attributes in their students, institutions of higher learning are expected to understand society's current needs and demands. Educational change therefore needs to follow a holistic system design in order to incorporate all integral components of the new ways of teaching and learning assisted by technology.

There is growing recognition of the need to change the traditional teaching-learning paradigm in higher education. The need for change is particularly compelling based on the recognition that the traditional teaching-learning paradigm is no longer the most effective strategy for preparing students to develop the skills and knowledge they need to be successful in a 21st century knowledge-based global economy. For example, the Business-Higher Education Forum's 1997 Report, *Spanning the Chasm*, reported that many college graduates were lacking in nine key attributes necessary for today's high performance jobs: leadership, teamwork, problem-solving, time management, self-management, adaptability, analytical thinking, global consciousness, and basic communication skills. (Business-Higher Education Forum, 1997). As noted in the most recent Business-Higher Education Forum (BHEF) report, *Building a Nation of Learners: The Need for Changes in Teaching and Learning to Meet Global Challenges*,

> Becoming a nation of learners requires fundamentally redesigning and disseminating new learning approaches. If Americans are to fundamentally improve learning, then they need to better understand what works and what does not and deliver the right solutions to those who can put them to work. (BHEF, 2003, p. 29)

Interestingly, since the rise of university education from the 11th century to the present day, the teaching methods of institutions of higher education have mostly remained the same. From the early stages of the university, lectures, given in Latin, were the core of all courses. Courses were offered through the higher faculties of theology, law, and medicine in order to train church and civil servants, as well as people seeking to enter the emerging professions. Fundamentally, higher education is still a process of imparting knowledge by means of lectures to those who wish to acquire it. The lecture method of instruction constitutes the core teaching method in most post-secondary institutions. Schachner (1938) maintained that the survival of the lecture method in modern higher education, when books are cheaper and plentiful, and students can obtain fuller and more thorough knowledge from texts and original documents, serves to illustrate its educational power. Lectures are an extremely efficient method of transferring information (Garvin, 2000). However, the current goals of education go beyond information transfer. Preparing students to think independently and work collaboratively is a formidable and ongoing task for institutions of higher education.

Higher education is currently addressing two major challenges: (a) to help accelerate the integration of technology into instruction, and (b) to help faculty move from the traditional mode of direct instruction toward more engaging, learner-centered instruction. Nowadays, institutions of higher learning are altering their instructional approaches, because life outside the academy has a huge potential impact on higher education. Some critical indicators signaling such impact include “the volume of information, technological competence, telecommuting, collaboration, re-skilling, increasingly complex demands, economics, and transformation of the workplace” (Oblinger, 1997, pp.3-4).

Dolance and Norris (1995) declared that “the IT Age is an epoch in which higher education could occupy *the* pivotal role in society” (p. 7), as the “teaching franchise could be joined by an emerging learning franchise” (p. 9). Many institutions of higher education are currently engaged in efforts to integrate technology into instruction, and to encourage changes in the traditional paradigm of teaching and learning. In 1998, UNESCO’s World Declaration on Higher Education recommended that colleges and universities address the potential and challenges of technology. Although universities have been successful in increasing access to technology resources, there has not been comparable progress in infusing technology into the instructional process. Faculty adoption of innovations in post-secondary institutions is most often a voluntary and isolated process. There are few but gradually increasing examples of systemic change in the teaching-learning process, and in the use of technology as a powerful instructional tool within institutions of higher education.

SYSTEMIC CHANGE

Systemic change is a cyclical process which takes into consideration the impact of change on all parts of the system, as well as the relationships between the component parts. In education, piecemeal change consists of modifying parts of a system. A change is considered to be *systemic* when it is comprehensive, thereby affecting and pervading all components and levels of the educational system (Banathy, 1991; Reigeluth & Garfinkel, 1994). Systemic connotes an overall understanding of the problem, along with the interrelationships and interconnections among the components of the system (Carr, 1996), and replacing or modifying an entire system (Reigeluth & Garfinkel, 1994).

The relative lack of progress in the adoption of systemic change in higher education may be the result of many factors, such as leadership style, faculty and administrator resistance to change, lack of faculty professional development and technical support, lack of incentives for change, and limited funding resources. These factors are influenced by the mission and culture of each institution, which in turn are shaped by the different higher education constituencies—students, faculty, administrators, and trustees.

One of the primary tasks of the top administration at any college or university is to design and effectively conduct educational changes according to the mission of the institution. Essentially, the mission and culture of the institution influence, in many ways, leadership and management expectations of the college or university president and other top officials. Charles Vest, president of MIT (Massachusetts Institute of Technology), declared “if there is one experience common to every university president in the United States during the past decade, it is being accused of leading institutional dinosaurs down a path to rapid extinction in a digital age” (MIT-Vest Annual Report, 2001, p. 2). Presidents manage according to institution type and specific needs and circumstances. For example, leading a major educational change within a community primarily dedicated to the development of the intellect requires understanding and support from all constituents, particularly from the faculty. Astin (1980) suggested that the most desirable presidential style would be the egalitarian president who spends much of his/her time interacting with a wide range of constituents: students, faculty, administrators at all levels, donors, and visitors. College and university presidents, along with other top officials, need to specifically take care of faculty needs and concerns.

Educators and researchers have agreed on the importance of faculty training and development to the success of “e-Learning”[5] implementation efforts (Kolbo & Turnage, 2002; National Staff Development Council—NSDC, 2001). As Kolbo and Turnage (2002) recognized, for institutions to remain at the

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[5] “E-Learning” or “electronic learning” is a widely-accepted term describing an educational environment supported by Information Technology (IT).

forefront of higher education, faculty development initiatives are of prime importance. In a move to enhance academic excellence through faculty development in higher education, Kolbo and Turnage recommended that faculty development initiatives (a) expand their focus, (b) employ a wider variety of methods and delivery formats, (c) focus on the delivery of learner-centered instruction, and (d) consider the potential cultural impact of technology.

It is important to understand the factors that might help advance or inhibit needed changes to teaching and learning in higher education. “As universities find their way in the digital age, emphasis should be on the enhancement of learning and the building of serious evaluation of institutional effectiveness into educational experiments” (MIT-Vest Annual Report, 2001, p. 3).

A unique opportunity to study the change process and to understand its impact on the faculty, administrator, and student change experience is afforded by one institution of higher education that has initiated a comprehensive, long-term, and large-scale effort to change the teaching-learning paradigm, and to infuse technology into all aspects of the teaching-learning process. This exploratory study was designed to investigate the process of systemic educational change as it affects faculty at the Mexico City campus of the ITESM system.

The Monterrey Institute of Technology and Higher Education (ITESM) system is a private, non-profit institution of higher learning composed of several campuses across Mexico (www.itesm.mx). With a total student enrollment of nearly 100,000 individuals at the high school, undergraduate and graduate levels, supported by approximately 8,000 faculty members, ITESM is an institution that has been recognized internationally for its ongoing effort to mandate and support changing the teaching-learning process throughout its entire system of 33 campuses. The annual edition of IQ Magazine (November/December 2003) recognized ITESM as one of the world's leading institutions in the effective use of technology, and commended its Information Technology (IT) infrastructure. The ITESM Educational Model uses technology to enable the didactic processes that allow students to work collaboratively and engage in problem-solving. The ITESM initiative provides a unique environment in which to study and better understand faculty perceptions and experiences of the mandated educational change processes, and to identify the perceived barriers and facilitators of change within a system of higher education.

It was anticipated that the results from this exploratory study could provide potentially useful insights into changes in the perceptions of faculty at different stages of the innovation process. It also provided a unique opportunity to explore differences in perceptions of the adoption of student-centered, technology-assisted teaching and learning among faculty at different levels of implementation, and with different demographic characteristics, such as work-status, academic unit (school), years of teaching at ITESM, educational level, gender, and extent of professional development. Implementation of the MET is closely related to the institutional strategy of faculty professional development.

> A major component of the ITESM change process has been professional development. To initiate a redesign of the ITESM teaching-learning process represents a high-risk decision. To develop individuals with deep knowledge in their academic field and with desired specific attributes represents a major institutional effort. At the end, however, the outcome will rely primarily on the faculty's commitment towards the new model. ITESM faculty members are expected to transition from the primary use of teacher-centered direct instruction and lecture-based teaching to the creation of more student-centered, interactive, and collaborative learning environments. (Resta, González, & Menchaca, 2003, p. 3)

The ITESM leadership has recognized that the present teacher-centered focus on knowledge transfer and systematic instruction emphasizes individualized work and uses few technological applications. "We know from research on cognitive learning that engaging in dialogue and working collaboratively with others facilitates learning and the development of deeper levels of understanding" (Resta, 2001, p. 1). Therefore, a plan was required to assist ITESM faculty members in migrating toward a new educational paradigm focused on knowledge construction and collaborative learning.

Purpose of the Study

Successfully launching and sustaining systemic change is complicated. Transforming organizations is a slow, evolving, difficult process, obstructed by multiple barriers. These barriers can be personal, internal, or administrative. In order to better implement systemic change in organizations, it is important to understand these barriers. At the same time, it is critical to identify the key driving forces that facilitate systemic change within organizations.

As mentioned earlier, the purpose of this exploratory study was to analyze faculty concerns and perceptions of facilitators, barriers, and leadership interventions in implementing a mandated systemic educational change to the teaching-learning process—the ITESM Educational Model—at the Mexico City campus of ITESM. In addressing this purpose, the researcher specifically sought to pursue the following objectives: (a) acquire a deeper level of understanding of faculty perceptions of facilitators and barriers in implementing a systemic educational change process mandated by the administration; (b) identify and analyze faculty levels of concern regarding adoption of the mandated systemic educational changes in the teaching-learning process across different stages of implementation; and (c) examine faculty perceptions of change management and leadership interventions that facilitate the implementation of the mandated educational changes to the teaching-learning environment. The term "mandated systemic educational change" refers in the study to the implementation of a student-centered, technology-assisted teaching-learning process commonly referred to as the ITESM Educational Model (MET).

The examination and comparison of faculty perceptions and concerns is anticipated to provide a deeper understanding of the required actions for successfully leading systemic change in higher education.

RESEARCH QUESTIONS

The study was guided by the following Research Questions (RQs):

1. RQ1: What are faculty perceptions of facilitators and barriers to the implementation of the ITESM Educational Model?

2. RQ2: How do individual characteristics and the extent of professional development affect present concerns of faculty regarding adoption of the ITESM Educational Model?

3. RQ3: What administrative leadership interventions are perceived as facilitating the implementation of the ITESM Educational Model?

METHODOLOGY

This exploratory study relied largely on quantitative-based research methodologies, supported by secondary analyses of institutional qualitative data and documents. Web-based electronic instruments were developed, selected, adapted, and translated into Spanish for: (a) Facilitator and Barrier Perceptions; (b) Stages of Concern; and (c) Leadership Intervention Perceptions. These questionnaires were assessed by quantitative data analyses using multivariate analysis of variance (MANOVA) for RQ1 and RQ3 and multinomial logistic regression for RQ2.

Data Collection and Analytical Procedures

In order to better implement systemic educational change at ITESM, a continuous effort has been made to collect data throughout the institution to monitor the evolution of the MET implementation. This ongoing effort has helped ITESM to understand the effectiveness with which the system has achieved the intermediate goals of the institution's 2005 mission that mandated the educational systemic change.

Institutional documents and data gathered during some change interventions were used in the study. Qualitative analyses were carried out on secondary data for the purpose of this exploratory study. Some system-level information was reported as a frame of reference, providing a broader context for the study. The pilot data collection process began with the initial exploration of facilitators and barriers to the implementation of the ITESM Educational Model during the 2001 3-week Summer Institute for ITESM faculty conducted at the University of Texas at Austin. The information gathered was part of the pilot data used for this study. Additional system-wide information was collected during the

Professional Development Program for faculty and academic administrators during Fall 2002 seminars in Monterrey and Mexico City.

The study's research questions were addressed after data was collected through an online four-section Web-based survey which participants were required to complete. Participants were drawn from the population of the Mexico City campus faculty—both full-time and part-time—who voluntarily participated during the Fall 2003 semester.

Instrumentation

Several Likert Scale-based instruments were used to collect data through an online four-section Web-based survey form, which was comprised of multiple selection questionnaires for individual characteristics (demographics), Stages of Concern, Facilitator and Barrier Perceptions, and Leadership Intervention Perceptions. A Likert-type scale is an instrument that associates ordinal values with qualitative attributes. It is a rating scale measuring the strength of agreement towards a set of clear statements. It is often administered in the form of a questionnaire used to gauge attitudes or reactions (http://www.uni.edu/its/us/document/stats/spss2.html#lik). The specific instruments used to collect data are described next.

Demographic Information Questionnaire

Basic demographic information was collected from participants for the purpose of classification into categories for data analysis procedures using a 15-item multiple-selection questionnaire. Important information relevant to all research questions included faculty work status, gender, educational level, academic unit, years of teaching at the institution, and advancement level in the professional development program.

Stages of Concern Questionnaire

The Stages of Concern Questionnaire (SoCQ) is part of the Concerns-Based Adoption Model (CBAM) developed by Hord and Hall (1987). The Concerns-Based Adoption Model "is an empirically based conceptual framework which outlines the developmental process that individuals experience as they implement an innovation and participate in staff development" (Hord, 1987, p. 12).

Facilitator and Barrier Questionnaires

The Facilitator and Barrier instruments were developed from different qualitative institutional sources and data. They were constructed as a 62-item questionnaire for facilitators, and a 71-item questionnaire for barriers.

Leadership Interventions Questionnaire/Checklist

The Change Facilitators' Actions to Support Change Checklist is also a component of the CBAM model (Hall & Hord, 1987). It was revised, expanded, and adapted into a 60-item Leadership Interventions Questionnaire/Checklist by Menchaca, Resta, González, and Porres (2004).

Assumptions

The following assumptions were made regarding this study:

1. All participants were involved in the process of systemic educational change.

2. Change is an individual process occurring at a speed unique to each person.

3. Professional development and training in didactic methods vary for each participant.

4. In addition to teaching, some participants held academic administration roles as dedicated and facilitative change agents with the unique responsibility of promoting the change process.

5. Individuals participated on a voluntary basis and responded to questions truthfully and to the best of their ability.

SCOPE AND LIMITATIONS OF THE STUDY

This study analyzed and examined faculty concerns and perceptions of facilitators, barriers, and leadership interventions in implementing the ITESM Educational Model. Although the ITESM System is experiencing system-wide systemic educational change, this research was conducted as an exploratory study at the second largest component institution of the ITESM System—the Mexico City campus[6]—and involved the participation of full-time and part-time faculty from the high school and undergraduate educational levels. Focusing on faculty from one large urban campus, the researcher was able to collect information from a large and diverse group of professors. The study relied largely on quantitative research methods supported by survey research. In survey research, a well-designed questionnaire facilitates collecting data from a large and diverse group of subjects during a relatively short period of time. Using a quantitative-based approach, the researcher was able to conduct data analyses for the study's research questions through different selected statistical methods to test the study hypothesis.

[6] The Mexico City campus is the second-largest campus in the ITESM system. With a student enrollment of approximately 12,000 and 1,000 faculty members, this campus offers a wide variety of academic programs at the high school, undergraduate and graduate educational levels, with emphasis in engineering, computer science and information technology, business administration, and social sciences.

There were some internal and external threats to the validity of the study. Selection biases resulting from the differential self-selection of the subjects for the comparison groups was a threat to the internal validity of the survey data. A threat to the external validity of the study was the potential reactive effects of testing. Participation in the study was strictly voluntary, and the Web-based survey form for collecting data was designed to provide anonymity to participant responses. The data's validity may be threatened by the number of faculty who refused to participate in the survey. People who refused to participate were potentially able to introduce systematic bias errors that threaten the validity of generalizations that can be applied to the population studied by a survey. There is a possibility that participants may have felt threatened by the content dimensions of the data collection instruments, and the responses provided may have been those considered to be socially acceptable. Together with the subjects' differential self-selection, the potential generalization of the study to other ITESM campuses implementing the MET may be limited.

Relevant campus-level and system-level information was used to provide a better understanding of the context of this study and to identify possible issues, barriers, and facilitators to be examined in the present research. Specifically, qualitative data collected in the systemic educational change process prior to conducting this research was used to construct and validate Likert-type perception instruments of facilitators, barriers and leadership interventions in the implementation of the MET. Validity in quantitative research depends on careful instrument construction. It remains to be examined whether similar results would be obtained with a random sample, or with other surveys conducted periodically on other campuses.

SIGNIFICANCE OF THE STUDY

Despite the limitations indicated above, it is expected that the results of this study may be at least partially generalized to other similar campuses (e.g., the large urban campuses in Monterrey, Toluca, Estado de México, and Guadalajara) within the ITESM system in Mexico. This is due to the shared institutional culture, norms, academic policies, and professional development common to all component institutions of ITESM. In addition, other institutions of higher education embracing systemic educational changes might use the information generated by this study as a reference.

In order to achieve an educational paradigm change at the institutional level, and to be able to lead and intervene appropriately during this change process, it is important for change facilitators to have a deep understanding of individual perceptions of faculty. The ITESM case provides a unique opportunity to examine what institutions can do to address the needs of different stakeholders in institution-wide, mandated educational change. Higher education administrators need to know how to lead the adoption of innovative ways of teaching and learning using educational technology. Based on prior research on educational systemic change, differences between faculty perceptions of what facilitates or obstructs the adoption of an educational innovation were anticipated at different stages of the implementation. Also, it was expected that the faculty's personal concerns would vary across the different stages of implementation when individual characteristics were considered.

As a result of the present study, it was anticipated that a better understanding will be achieved of the change management process necessary for new educational paradigm initiatives to succeed. This research provided a unique opportunity to study a large-scale effort by a multi-campus higher education system in Mexico to change its approach to teaching and learning.

ORGANIZATION OF THE STUDY

This chapter provides a summarized overview of current trends and challenges in higher education and the need for this investigation. Chapter 2 presents important details of related literature associated to the topic. In Chapter 3, the researcher covers the study's research methods, procedures, and instrumentation, including an overview of the study's participants, data collection process and data analyses. Chapter 4 provides a description of the study's sample and the study's data analyses, obtained results and findings. Finally, Chapter 5 discusses the most important findings of this exploratory study, its conclusions and implications.

SUMMARY

Post-secondary institutions are currently being challenged to undergo a radical transformation and renewal. Such transformation is often referred to as *The Learning Revolution* (Oblinger, 1997), and will take place in a new era of global digital competition in higher education. Change in the teaching-learning processes of colleges and universities is required to better train students within a highly demanding society.

This exploratory study examined faculty concerns and perceptions of barriers, facilitators and leadership interventions in the systemic change process for implementing a new, redesigned teaching-learning process at a post-secondary institution in Mexico: the Mexico City campus of the Monterrey Institute of Technology and Higher Education (ITESM).

System-wide paradigm shifts in the teaching-learning process represent a significant challenge and may succeed through a combination of effective change strategies, professional development, and support-based leadership. The ITESM educational initiative provided the opportunity to explore large-scale change strategies currently underway for faculty and academic administrators. Lessons learned from this exploratory study may provide useful insights to other educational change and innovation projects within the higher education endeavor.

This chapter provided a broad overview of current change trends and challenges in higher education and a brief description of the study. The next chapter provides important theoretical background to the study, as contained in the literature review completed by the researcher on topics including the evolution of the university's teaching-learning processes, the new educational paradigms, the integration of technology into education, educational systemic change, implementing change concerns, professional development, and the ITESM system initiative.

DEFINITIONS

For purpose of this study, the following terminology and definitions were used:

The ITESM Educational Model (MET) refers to the redesigned teaching-learning process. It can be described as student-centered, technology-assisted, interactive, collaborative, and contextualized "e-Learning". The ITESM educational paradigm builds on a unique learning philosophy emphasizing knowledge acquisition and development of specific values, attitudes, and skills; a learning environment assisted by the use of technology and supported by specific didactic methods. Course components are designed to promote deep, active, engaged learning, supported by certain didactic methods appropriate to the content area, including case-based, problem-oriented, and project-based learning approaches. Inquiry-based learning is used to build self-directed learning skills in addition to collaborative teamwork skills, promoting information and idea exchange between students, and between students and faculty.

Participants refers to the human subjects involved in this study. They were drawn from the population of the Mexico City campus faculty—both full-time and part-time professors—who voluntarily responded for participation.

Concerns refers to the composite representation of feelings, preoccupations, thoughts and considerations given to a particular issue or task. Faculty concerns regarding the adoption of the ITESM Educational Model refers to responses to the 35 items of the Stages of Concern Questionnaire (SoCQ). The stages of concern refer to groups of feelings, preoccupations, thoughts, and considerations that together describe a stage in the development of the affective response to an educational innovation.

The analysis of concerns profiles frequently involves plotting the percentile scores of each individual for each of the seven domains or stages of concern: (1) awareness, (2) information, (3) personal, (4) management, (5) consequence, (6) collaboration, (7) refocusing on a graph. Hall (1979) reported that "this provides the most complete clinical interpretation and assessment of both individual and group data" (p. 34). For this study, the score for each of the seven domains was converted into three composite mean scores of *Self*, *Task*, and *Impact*. Together, the scores from the three composite categories defined the personal concerns profile as mainly self, task, or impact. Based on the three scores, all participants were assigned to a primary present concerns category: (1) Self, (2) Task, or (3) Impact.

Facilitators refers to the various forces that support the proposed changes to an educational innovation. In the present study, Facilitators refers to the "driving forces" that support the implementation of the ITESM Educational Model.

Barriers refers to the various forces that resist the proposed changes to an educational innovation. In the present study, Barriers refers to the "restraining forces" that resist the implementation of the ITESM Educational Model.

Professional Development refers to the ITESM Faculty Development Program of Teaching Skills (FDTS). This program was designed to assist the transformation of faculty teaching practices from traditional forms of direct instruction to a technology-assisted, learner-centered model of knowledge construction and active learning. The program's design aimed at helping faculty integrate online and face-to-face collaborative learning into their instructional practices. ITESM's FDTS Program assists faculty in developing knowledge and skills related to new educational paradigms and strategies, didactic techniques (e.g., problem-based learning, project-oriented learning, collaborative learning, case-study learning), performance assessment, and use of new technology tools for learning.

The Implementation Level of the ITESM Educational Model was defined by five categorical levels: (1) non-user, (2) inexperienced user, (3) experienced user, (4) experienced-advanced user, and (5) renewing user.

Facilitator and Barrier Perceptions of the mandated implementation of the ITESM Educational Model were grouped into different categories of interest through factor analysis, and assessed through MANOVA analyses.

Facilitating Leadership Interventions refers to the actions and behaviors (i.e., interventions) of leaders that facilitate a proposed educational change. In the present study, Facilitating Leadership Interventions refers to the actions and behaviors of ITESM leaders that facilitate the implementation of the MET. These leadership interventions were represented by a random variable, defined by six categories of change interventions: (a) Developing, Articulating and Communicating a Shared Vision of Change; (b) Planning and Providing Resources; (c) Investing in Professional Learning; (d) Checking on Progress; (e) Providing Continuous Assistance; and (f) Creating a Context Supportive of Change. Facilitating Leadership Interventions categories were adapted and expanded from the Change Facilitators' Actions to Support Change Checklist, a component of the Concerns Based Adoption Model, or CBAM (Hall et al., 2001); these categorical groupings were determined through factor analysis.

Systemic change is a cyclical process, which takes into consideration the impact of change on all parts of the system, as well as the relationships between the component parts. Within an educational system, change is considered to be *systemic* when it is comprehensive, thereby affecting and pervading all its components and levels.

Chapter 2: Literature Review

INTRODUCTION

The purpose of this exploratory study was to analyze faculty concerns and perceptions of facilitators, barriers, and leadership interventions in implementing a mandated systemic educational change to the teaching-learning process at the Mexico City campus of the Monterrey Institute of Technology and Higher Education (ITESM), headquartered in Monterrey, Mexico. This chapter provides relevant background to the study's literature review. First, a brief historical overview of higher education and a comprehensive comparison of different educational paradigms are provided, followed by a summarized description of the integration of technology into education and related insights affecting the future of higher education. Next, the researcher discusses educational systemic change, educational leadership and the study's theoretical model supporting Research Question 2 (RQ2) and Research Question 3 (RQ3)—The Concerns Based Adoption Model (CBAM) followed by professional development as a strategy for implementing educational change. Finally the specific research setting including a summary of ITESM's activities and the institution's ongoing initiative for implementing systemic educational change at the system-wide level, and a brief background of the ITESM Mexico City campus is provided.

In order to address the purpose of the study, the researcher specifically sought to pursue the following objectives: (a) acquire a deeper level of understanding of faculty perceptions of facilitators and barriers in implementing a systemic educational change process mandated by the administration, (b) identify and analyze faculty levels of concern regarding adoption of the mandated systemic educational changes in the teaching-learning process across different stages of implementation, and (c) examine faculty perceptions of change management and leadership interventions that facilitate the implementation of the mandated changes to the teaching-learning environment. The term "mandated systemic educational change" refers in the study to the implementation of a student-centered, technology-assisted teaching-learning process commonly referred to as the ITESM Educational Model (MET).

Martin (2002) stated that the MET is based on specific characteristics that all courses taught at ITESM must have, regardless of the level or discipline. These key characteristics are:

1. Students learn to work collaboratively.
2. Students acquire relevant and deep knowledge.
3. Students direct their own learning process.
4. Students improve their learning process through continuous evaluation.

5. Students rely on Information Technology (IT) to enhance their learning (pp. 22-28).

A HISTORICAL OVERVIEW OF HIGHER EDUCATION

The concept of the modern university, as we know it today, originated in the Middle Ages with the founding of the first universities in Europe during the 13th century. Schachner (1938) reported that "Three all-embracing institutions characterize the Middle Ages—the Church, the Empire, and the University…but only the University was a unique medieval invention…originated at some time during the twelfth century" (pp. 1, 3). However, the "very name *university* does not appear until the beginning of the thirteenth century" (p. 42). The first universities to be founded include those in Bologna, Paris, Oxford, and Salamanca, a group of institutions that have significantly influenced modern higher education.

> The history of higher education is largely the history of the European university and its related evolution into an institution, or congeries of institutions, flexible enough to serve the needs of enormously different societies in every part of the world, culminating in its universal acceptance as the key institution of modern and developing societies everywhere. (Perkin, 1997, p. 4)

The migration of the university to the non-European world took place shortly after Columbus reached America in 1492, and its adaptation to the needs of developing societies and the anti-colonial reaction became quite clear. This was certainly the case in Mexico, which witnessed the end of its last native civilization—the Aztec Empire—after the conquest by Spanish troops in 1521. These circumstances led to Spanish colonialism (1519–1810), which exerted a strong influence until the 19th century. The transition to modernity[7] came after the independence movement (1810–1821) and the reform movement (1857–1870). "Mexican higher education has its origins in the Colonial Period; the Royal and Pontifical University of Mexico was founded (1547) under the same privileges and principles of the University of Salamanca" (Pallán, 1994, p. 13). From 1573, universities and colleges in Mexico were founded with the primary purpose of training students as church and civil servants as well as students involved in the emerging professions. Sánchez (1944) declared that higher education in Mexico was strongly influenced by the "European Illustration"[8].

The university institution has been going strong for more than 800 years, and is now present in almost every country in the world. Its mission, scope, size, and curriculum have changed over time. However, higher education's teaching methods have remained virtually the same throughout several centuries. In Chapter 1, the author highlighted how, from the early stages of the university,

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[7] The term "Modernity" or the "Modern Age" is applied to the period of world history extending approximately from the mid-nineteenth century to the present day.

[8] The European Illustration or Age of Enlightenment describes the trends in thought and letters in Europe and the American colonies during the 18th century prior to the French Revolution. The phrase was frequently employed by writers of the period itself, convinced that they were emerging from centuries of darkness and ignorance into a new age enlightened by reason, science, and a respect for humanity.

lectures comprised the core of all courses offered through higher faculties such as theology and law, in order to train church and civil servants as well as people seeking to enter the emerging professions. So-called disputations—bitter battles of wits—constituted the backbone of medieval scholasticism. Schnacher (1938) stated that "books were rare and valuable possessions in the Middle Ages, as each manuscript had to be copied laboriously on expensive parchment" (p. 326). Consequently, the desired and required knowledge was primarily available through professors' lectures, as the average student could afford only a few books. Within the lecture system of instruction, the master[9] orated, and the student listened and took notes—the genesis of what is today known as *traditional* or *directed instruction*. The medieval educational context was influenced by the invention of Gutenberg's printing press in the late 1450s. This technological advent changed the paucity and cost of books, skyrocketed the number of volumes in university libraries, and resulted in a new learning environment. Farrington (1997) indicated that inexpensive printing fueled one of the great information revolutions, as books and newspapers brought literacy and knowledge to millions and transformed education, society, and economics.

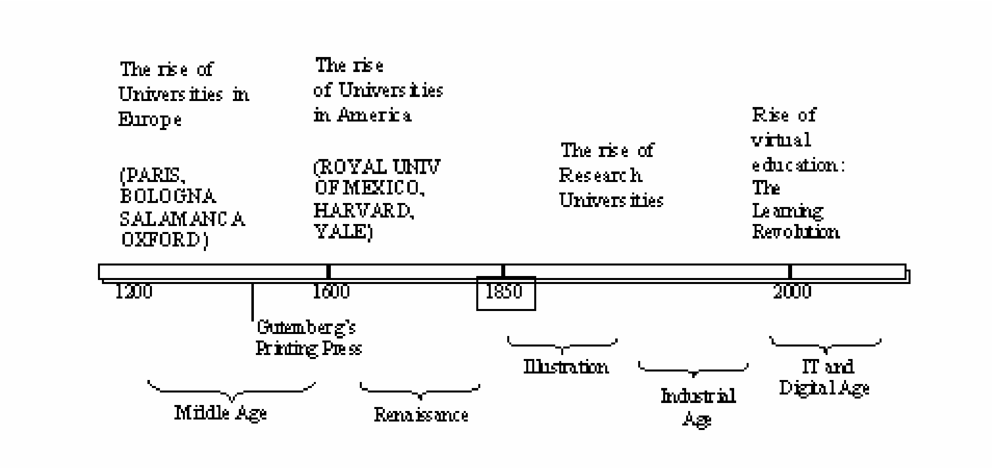
Although this technological force exerted a huge influence on the educational setting, the lecture method of instruction continued to constitute the

[9] During the Middle Ages, university professors were known as "masters".

backbone of most institutions of higher learning. Fundamentally, higher education is still a process of imparting knowledge by means of lectures to those who wish to acquire it.

But now, society—and higher education—are undergoing a fundamental transformation from the Middle Ages and the Industrial Age, to the Information Age. Based on the history of higher education, a summarized illustration of the evolution of colleges and universities is provided by the researcher in Figure 1.

Figure 1. The historical evolution of higher education



A NEW EDUCATIONAL PARADIGM: FROM TEACHING TO LEARNING

The evolution of higher education has resulted in new educational paradigms. Changing paradigms is a complicated process. Barr (1995) stated that until recently, a college was an institution that existed to provide instruction.

Subtly, but profoundly, we are shifting to a new paradigm: A college is an institution that exists to produce learning. The shift to a learning paradigm liberates institutions of higher education from a set of difficult constraints. The learning paradigm ends the lecturer's privileged position, honoring in its place whatever approaches serve best to promote learning of particular knowledge in particular students. The learning paradigm envisions the institution itself as a learner over time; it continuously learns how to produce more learning with each graduating class, each entering student.

Until the first half of the 20th century, educational goals reflected society's focus on the need for basic social skills (e.g., reading, writing, and arithmetic) and a certain body of information-knowledge considered to be essential and sufficient for all citizens. However, as technology has become more capable and pervasive, and as more types of technological resources have become available, everyday life has also become more complex and demanding. Therefore, academic communities and educators must determine if educational goals should be confined to specific information-knowledge, or to a cluster of social skills. Furthermore, identifying exactly how new skills and methods will differ has created a new dilemma. This dilemma has proved to be controversial due to growing disagreements among learning theorists which have centered on which strategies will prove most effective in achieving today's educational goals. "This controversy has served as a catalyst for two very different views on teaching and learning" (Roblyer, 1997, p. 55). Academics and learning theorists can be categorized as having two different perspectives on teaching and learning; both are widely accepted, but differ strongly.

On the one hand, the *directed instruction* perspective is grounded primarily in behaviorist learning theory and the information-processing branch of cognitive learning theories. On the other, the *constructivist view* evolved from other branches of thinking in cognitive learning theory. Both approaches attempt to identify what Gagne (1985) called "the conditions of learning or the sets of circumstances that obtain when learning occurs" (p. 2). Both views are based on the work of respected learning theorists and psychologists (e.g., Skinner, Thorndike, Atkinson, Ausubel, Gagne, Dewey, Vygotsky, Piaget, and Bruner). "The two approaches diverge, indeed they go in opposite directions, when they define learning and describe the conditions required to make learning happen and the kinds of problems that interfere most with learning" (Roblyer, 1997, p. 56).

Summarizing, the differences are rooted within particular epistemologies—beliefs about the origins, nature, and limits of human knowledge—of each educational perspective's philosophical foundations. Directed instruction advocates believe that knowledge has a separate, real existence of its own outside the human mind, and that learning happens when this knowledge is transmitted to the learner (Molenda, 1991; Phillips, 1995, as cited by Roblyer, 1997). On the constructivist side, philosophers believe that humans construct knowledge in their minds, so that learning happens when a learner constructs both mechanisms for learning, and this unique version of the knowledge is influenced by background, experiences, and aptitudes (Wills, 1995, pp. 15–20). Both educational perspectives are valid and have derived models determined by specific attributes. These attributes have been summarized by the researcher and are shown in Table 2.

Table 2. The Directed Instruction and Constructivist Approaches (Researcher's summary of educational characteristics covered in Roblyer & Edwards, 1997, pp. 55-59)

The Directed Instruction Approach	The Constructivist Approach
Teacher-centered	Student-centered
Knowledge transfer	Knowledge construction
Use of transmission models	Unstructured learning
More individualized work	More group work
Fewer technological applications	More technological applications
Learning theories associated: behavioral, information processing	Principles of learning derived from branches of cognitive science
Focus on systemic instruction	

There are pros and cons to each perspective. For example, the learning theories and instructional design approaches associated with directed instruction have profoundly and positively affected American curriculum and classroom practices over many decades. The greatest criticisms of directed methods charge irrelevance to the needs of current students and recite key problems such as problem-solving inability, non-capacity to work cooperatively, and students' lack of motivation.

Despite the growing popularity of the constructivist view, its principles and practices have also been subjected to serious criticisms: skill learning is uncertain, students' ability to choose the most effective form of instruction is unclear, and constructivism somehow requires prior knowledge. Additionally, there is a lack of sufficient scientific evidence demonstrating the effects of constructivist methods.

Professors and students alike would benefit from a merger of these two educational approaches. "Professors need to forge a link between the two planets so that students may travel freely from one to another, depending on the characteristics of the topics at hand and each person's learning needs" (Roblyer, 1997, p. 56). It appears that current learning environments strongly desire to seek a balance between both educational approaches.

Garvin and Sweet (1992) emphasize that debates about educational models tend to be impassioned, intense, and remarkably repetitious. These authors have also examined two models of education that have co-existed uneasily for decades: (a) the teacher-centred model, and (b) the active learning model. The teacher-centred model is the more traditional; its primary goal is the transfer of information from an expert (the professor) to novices (the students). Although this approach dominates modern education, Garvin and Sweet summarized various objections into three broad categories: cognitive, philosophic, and pragmatic. Such criticisms have reinforced the appeal for an alternative model: active learning or student-centred education. Within an active learning environment, the teacher's role is to facilitate and to guide rather than transmit information. The student-centred approach has long been a fixture in debates over educational reform. The model has gained a considerable following, but there appear to be tremendous barriers impeding its adoption.

Garvin and Sweet (1992) analysed powerful forces that sustain the traditional teacher-centred approach to education. Some forces are as simple as inertia and an unwillingness to change. The forces can be grouped into three general categories: (1) political and institutional barriers, (2) epistemological barriers, and (3) practical barriers. These authors also identified certain barriers impeding the adoption of active learning: evaluation, the lack of clear precepts for practice, and the persistence of assorted myths and misconceptions about active learning.

A summarized description comparing the instruction and learning paradigms is provided in Table 3.

Table 3. Comparing Educational Paradigms (Barr, 1995, pp.16-17)

The Instruction Paradigm	The Learning Paradigm
Mission and purpose • Provide/deliver instruction • Transfer knowledge from faculty to students • Offer courses and programs • Improve the quality of instruction • Achieve success for diverse students	**Mission and purpose** • Produce learning • Elicit student discovery and construction of knowledge • Create powerful learning environments • Improve the quality of learning • Achieve access for diverse students
Criteria for success • Inputs, resources • Quality of entering students • Curriculum development, expansion • Quantity and quality of resources • Enrolment, revenue growth • Quality of faculty, instruction	**Criteria for success** • Learning and student success outcomes • Quality of exiting students • Learning technologies development, expansion • Quantity and quality of outcomes • Aggregate learning growth, efficiency • Quality of students, learning
Teaching/learning structures • Atomistic; parts prior to whole • Time held constant, learning varies • 50-minute lecture, 3-unit course • Classes start/end at same time • One teacher, one classroom • Independent disciplines, departments covering material • End-of-course assessment • Grading within classes by instructors • Private assessment • Degree equals accumulated credit hours	**Teaching/learning structures** • Holistic; whole prior to parts • Learning held constant, time varies • Learning environments • Environment ready when student is • Whatever learning experience works • Cross discipline/department collaboration • Pre-/during-/post-assessment • External evaluations of learning • Public assessment • Degree equals demonstrated knowledge and skills

(table continues)

The Instruction Paradigm	The Learning Paradigm
Learning theory • Knowledge exists “out there” • Knowledge comes in “chunks” and “bits” delivered by instructors • Learning is cumulative and linear • Fits the storehouse of knowledge metaphor • Learning is teacher-centred and controlled • “Live” teacher, “live” students required • The classroom and learning are competitive and individualistic • Talent and ability are rare	**Learning theory** • Knowledge exists in each person’s mind and is shaped by individual experience • Knowledge is constructed, created, and “gotten” • Learning is a nesting and interacting of frameworks • Fits learning how to ride a bicycle metaphor • Learning is student-centred and controlled • “Active” learner is required, but not “live” teacher • Learning environments and learning are cooperative, collaborative and supportive • Talent and ability are abundant
Productivity/funding • Definition of productivity: cost per hour of instruction per student • Funding for hours of instruction	**Productivity/funding** • Definition of productivity: cost per unit of learning per student • Funding for learning outcomes
Nature of roles • Faculty are primary lecturers • Faculty and students act independently and in isolation • Teachers classify and sort students • Staff serve/support faculty and the process of instruction • Any expert can teach • Line governance; independent actors	**Nature of roles** • Faculty are primarily designers of learning methods and environments • Faculty and students work in teams with each other and other staff • Teachers develop every student’s competencies and talents • All staff are educators who produce student learning and success • Empowering learning is challenging and complex • Shared governance; team work

INTEGRATING TECHNOLOGY INTO EDUCATION

Having examined the historical evolution of higher education and different views on the educational processes established in colleges and universities, the researcher will discuss the integration of technology into education.

The World Declaration on Higher Education for the 21st Century (UNESCO, 1998) maintained that academic administrators are being challenged to lead their institutions to respond to the world's fast changes and challenges with new educational models. UNESCO's declaration recommended that colleges and universities address both the potential and the challenges of technology. This declaration applied additional pressure and increased awareness and scrutiny on higher education. It also implied that strong institutional leadership is required within colleges and universities worldwide to adequately propel them into the IT environment.

Goodman (2001) asserted that presidents and administrators of universities worldwide are facing a common challenge. The information technology revolution is having and will have profound impacts on the educational process. An underlying theme is how to react to or adapt to technology to fit the mission and goals of the institution.

At this point, *technology* needs to be defined, and the integration of technology into education described. The Merriam-Webster Dictionary (1994, p. 739) defined technology as "a manner of accomplishing a task using technical methods or knowledge." But when a professor uses a laptop computer to run a business simulation in a practical demonstration to a group of students in different countries, he/she is using the latest commonly-denominated *educational technology*. "Educational technology itself is not new at all, however, and it is by no means limited only to the use of equipment, let alone electronic equipment" (Roblyer, 1997, p. 5). In his comprehensive description, *The Evolution of American Educational Technology*, Paul Saettler (1990; as cited by Roblyer, 1997) pointed out:

> Educational technology…can be traced back to the time when tribal priests systematized bodies of knowledge…it is clear that educational technology is basically the product of a great historical stream consisting of trial and error, long practice and imitation, and sporadic manifestations of unusual individual creativity and effort. (p. 4)

Saettler held the opinion that a conclusive definition of educational technology may be a process rather than a product. Further, Muffoletto, 1994 (as cited by Roblyer, 1997), considered technology "not a collection of gadgets, machines, and devices, but a way of acting" (pp. 24, 25).

Goodman and Reddy (2001) stated that using technology to enable learning through the creation and communication of information is a time-honored tradition:

> More than 5,000 years ago, the invention of writing spurred the first information revolution, making it possible for one generation to accumulate information and communicate with the generations that followed it. When the printing press was invented about 500 years ago (in 1459 A.D.), the second information revolution began, marked by mass distribution of the printed word. Just 50 years ago, the invention of computers ushered in the third information revolution, making it possible to transform raw data into structured information, to transform that information into knowledge, and to transform knowledge into action using intelligent software agents and robots. (Goodman & Reddy, 2001, p. 3)

For professors, researchers, and practitioners in the field, any useful definition of educational technology must focus on the process of applying tools for educational purposes. Roblyer, Edwards and Havriluk (1997) have stated that technology in education may be understood from diverse perspectives: as media and audiovisual communications, as instructional systems, as vocational training tools, and as computers and computer-based systems.

Regardless of the preference for one learning model or another, every college or university community—faculty, students, trustees, alumni, administrators, and staff—is aware of the growing significance technology has in all academic activities. Technology is everywhere. There is a widely-held belief that technology already plays a high-profile role in the higher educational system.

There is, in fact, an additional rationale for integrating technology into education. "Although technology (especially computers) has been in use in education since the 1950s, research results to date have not made a strong case for its impact on teaching and learning…but extensive research with computer-based methods supports only the general conclusion that technology has made a difference." (Roblyer, 1997, p. 28). In *A Vision for Life Long Learning—Year 2020* (Hinrichs, Microsoft Research, 2002) Bill Gates—the CEO of Microsoft Corporation—pointed out that computers have long been a powerful tool for education, "giving students access to a new world of information, sparking creativity, and facilitating rich communication and collaboration across vast distances" (p. i).

Resta, González, and Menchaca (2003) suggested that although universities have been successful in increasing access to technology resources, there has been no comparable progress in infusing technology and new pedagogies into the instructional process. Whereas the use of computers to enhance learning dates back to the 1950s, these early efforts have not yet had a widespread systemic impact on education. Educational approaches need to be student-oriented and technology-assisted in order to train individuals with specific attributes and skills. Technology is a critical component of new learning environments and of innovative curricular initiatives. "Now we have a powerful opportunity to use the Internet to enhance the process of conceiving, shaping, and organizing knowledge for use in teaching. In doing so, we can raise the quality of education everywhere" (MIT-Vest Annual Report, 2001, p. 4).

Although information technology has brought about many opportunities to enhance student learning, the new role of the professor—a role requiring him/her to be a facilitator of learning instead of an information transmitter—is still important within the teaching-learning process. The new educational role involves faculty integrating cognitive tools into their instructional practices and generating new learning environments in which students are more active and responsible for their own learning. "We do not advocate replacing the human teacher with technology! Future technology must live in a symbiotic relationship amongst teachers, students, parents and society at large" (Bajcsy, 2002, p. 1). To accomplish this goal, faculty members need help in moving from roles as information transmitters to roles as facilitators of learning. To support faculty in this type of change, academic administrators need to act as facilitative leaders of a community dedicated to the intellect. Interestingly, Benezet's (1981) dichotomy pointed out the need for every university president to act as an educator, not only as a CEO with an emphasized managerial profile.

THE FUTURE OF HIGHER LEARNING

UNESCO (2001) reported that within the next two decades we will witness an unusual demand for higher education as well as its great diversification. What does the future of higher learning look like? What threats and opportunities are now faced by colleges and universities?

Society is being transformed by market forces, global competition and the power of technology, which has caused some businesses and large corporations to collapse. Higher education faces the same threats and dangers. "With universities everywhere competing for students and engaging in borderless learning, and companies around the globe all calling for demonstrable proof that tomorrow's workers are equipped, action is necessary" (Cerf & Schutz, 2002, p. 3). Dolance and Norris (1995) hypothesized that higher education will become much broader than our traditional research, liberals arts, and community colleges. These authors predicted the future will also include commercial providers of higher education. Their hypothesis is today's reality: For-profit institutions such as Sylvan International, Apollo Group Inc., Devry Inc., and the University of Phoenix have shown an increased growth in the higher education endeavour.

The most dramatic new development in the field of non-traditional education is the growth of distance learning using the Internet. With the Internet, lectures can be transmitted anywhere in the world, while providing students with the chance to ask questions and receive rapid answers by email. Bok (2003) reports that by the year 2000, education via the Internet was already a USD $2 billion business, growing by 40 percent each year. “The Internet is revolutionizing the way Americans learn” (p. 87).

Oblinger (1997) pointed out that uncertainty about the future status of higher education focuses on whether colleges and universities are leaders of the learning revolution or mere bystanders. Higher education is on the brink of a revolution due to the power of digital technology and the information expansion. Life outside academia has a potential impact on colleges and universities. Larry Ellison, the CEO of Oracle[10], looks forward to a future in which e-learning will overcome the “wild inefficiencies of American higher education” (Bok, 2003, p. 87). Additionally, Peter Ducker—a well known business professor and consultant—considers the trend of delivering more lectures and classes off-campus via satellite or two-way video at lower costs (Bok, 2003).

Certain critical indicators signalling the impact of life outside the academy on institutions of higher education include the increased volume of information, technological competence, telecommuting collaboration, re-skilling, changing demographics, government influence, college students’ selectivity, increasing educational demand, economics, and the transformation of the workplace.

In *Transforming Higher Education*, Green (1997) examined growing forces for change, including issues of access to higher education, funding,

[10] Oracle is a leading multinational software firm headquartered in the USA.

economic and social development, accountability, autonomy, educational models, teaching-learning processes, use of technology, and internationalization. In addition, the public, government, students, faculty, staff, governing boards, and academic administrators increasingly recognize the need for change and are exploring pathways to develop a new vision of the concept and role of higher education.

In *Pressures for Fundamental Reform*, Guskin and Marcy (Field Guide to Academic Leadership, 2002) highlight the urgency for significant institutional change in higher education. This increasing pressure focuses on the costs of higher education, what students are learning, and the use of new Information Technology (IT) in the educational process.

Interestingly, Alvin Toffler—a well-known writer—warns that "good education" no longer means traditional-age groups of students sitting in front a lecturer in a classroom. This traditional educational model belongs to a massive-scaled production economy that clearly does not meet current and future social demands (Enfoque, 2002, p. 13).

Despite the above-mentioned threats and challenges, Charles Vest—the president of MIT—has less doubt that the residential university will remain an essential element of society, providing the most intense, advanced, and effective education. "The residential university will not only survive, it will prosper; it will also be enhanced by the appropriate use of new technologies. The Internet will revolutionize all kinds of teaching and learning, and some of that will necessarily and appropriately be done in the for-profit world" (MIT-Vest Annual Report, 2001, p. 3).

EDUCATIONAL SYSTEMIC CHANGE

UNESCO's World Declaration on Higher Education (1998) stated that "colleges and universities must take into account both the potential and the challenges of technology" (p. 21). With the advent of the personal computer and other innovations of the Information Technology Age (e.g., networks, satellite communications, software, and the Internet) during the last 30 years, a number of colleges and universities have engaged in a radical transformation that addresses the adoption of technology and more importantly, the transformation of the teaching-learning process. Effective transformation of the teaching-learning process in a post-secondary institution requires this educational change to become systemic.

Systemic change is a cyclical process, which takes into consideration the impact of change on all parts of the system, as well as the relationships between the component parts. "Systemic change suggests a change *of* the system rather than *within* the system" (Jenlink, Reigeluth, Carr, & Nelson, 1996, p. 42). A change is considered to be *systemic* when it is comprehensive, thereby affecting and pervading all components and levels of the educational system (Banathy, 1991; Reigeluth & Garfinkel, 1994).

Several different authors have addressed the subject of educational change. For example, Sashkin and Egermeier (1993) conducted a 30-year historical review of educational change research and practices. They described three differing perspectives and strategies with the most influence on educational change:

1. The rational science perspective (the research and development approach of the 1950s to 1970s), which posits that change is created by the dissemination of innovative techniques;

2. The political perspective (the top-down approach of the 1980s), which brings about change by legislation and other mandates; and

3. The cultural perspective (the bottom up approach of the 1990s), which emphasizes changes in meanings and values within the organization.

Additionally, Sashkin and Egermeier (1993) described four strategies for improving school performance:

1. Fix the parts: focus on the transfer and implementation of specific innovations.

2. Fix the people: improve the knowledge and skills of teachers and administrators through professional development.

3. Fix the school: strategy and organizational development aim to help people in a school solve their problems more effectively.

4. Fix the system: this strategy of systemic reform incorporates the other three strategies in a broader context and includes the notion of restructuring.

The systems approach, as described by Sashkin and Egermeier (1993), is the third wave of reform. These authors included a reference bibliography, illustrative programs, and additional sources.

Research describing the successful implementation of large-scale, system-wide change is needed (Hallinger & Eduards, 1992, p. 132); particularly research that looks at the big picture and addresses the "whole of the organization" in a systems approach (Osborn & Cohran, 1992, p. 15). Research on organizations involved in systemic change can provide understanding of the processes and factors that determine successful implementation of the transformation process. "It is one thing to use technology in isolated classrooms and quite another to make technology a potent force in transforming an entire school or an entire education system" (Kappan, 1996, p. 70).

In the 21st century, institutions of higher education must engage in the training of learners that are defined in quite a different way from those involved in traditional educational systems. Banathy (1995) urged readers to learn to think about education as a system, to understand and to describe it as a system, and to design it so that it will manifest systemic behavior:

> Put the systems view into practice and apply it in educational inquiry. Once we individually and collectively develop a systems

> view, then (and only then) can we become systemic in our approach to educational reform; only then can we apply the systems view to the re-conceptualization and redefinition of education as a system; and only then can we engage in the design of systems that will nurture learning and enable the full development of human potential. (Banathy, 1995, p. 13)

Carr (1996) reported that educational systemic change is based on systems thinking and has recently focused more on general systems theory. The application of holistic thinking to educational systems design—the creation and development of new learning environments—is the focus of many researchers in the field of systemic change.

Educators have recognized that educational changes require a systemic change approach within their communities to significantly enhance their ability to meet all students' needs for coping with current society. The purpose of systemic change is to create a better educational system than that which currently exists (Jenlink et al., 1996). The Information Age requires systemic change in order to articulate new educational perspectives that better fit current demands from society.

Carr (1996) stated that systemic change recognizes the role of power and leadership in any changing system. Therefore, shifting power and studying power relationships is an important facet of changing schools systemically. Systemic change also recognizes the importance of context and cultural understanding.

Furthermore, changing a paradigm requires organizational support for the proper use of technology. A radical paradigm change also requires organizational change.

Within the higher educational level, Austin and Moore (1999) have recommended viewing the university as a system and using multiple systemic-based strategies as effective tools. Austin and Moore research project also produced interesting findings about change. These authors found that universities can be categorized by levels of change and by strategies used in producing changes. In order to facilitate change, post-secondary institutions must emphasize faculty and leadership development. Department chairs and faculty members sometimes found it challenging to interpret messages from senior leaders. Both groups also needed opportunities to learn skills such as team management and strategic planning.

Austin and Moore (1999) conceptualized the university system in four levels: institutional, colleges, departments or units, and faculty/staff. They asserted that these levels are not hierarchical. Each level represents an equally important aspect of the university system. Academic leaders must think about the multiple institutional levels and how new efforts are being interpreted throughout the system.

> We believe that many of the change efforts that are occurring across the country tend to be at the institutional level and they are

> often rhetorical presentations of goals by institutional leaders…We would say that it is probably a good idea for institutional leaders to consider how those change efforts are being interpreted throughout different levels of the institution because, we would argue, it is especially at the department and faculty levels that these changes must be interpreted and understood. (Austin & Moore, 1999, p. 31)

These authors suggested that establishing procedures and policies that support change efforts is also effective in assisting universities in managing the educational change process. Likewise, organizational restructuring can be effective in creating better connections to meet institutional needs. These authors add that another critical component facilitating the educational change is the evaluation and reward system for both faculty and department chairs. If faculty members are asked to work in ways that complement the various missions of the university, and that require new methods and strategies, then evaluation systems need to be altered to reward those who meet new expectations.

> To put it simply: if faculty are being asked to work across the missions, evaluation systems should not only focus, as they sometimes have in American universities, on research productivity. Institutional leaders have a significant role in articulating the mission and vision consistently and in many ways, but we also have to recognize that no single person is in charge of these change efforts. (Austin & Moore, 1999, p. 48)

Effective educational change comes from two directions simultaneously. Institutional leaders need to think systemically, and they need to articulate the institutional mission. But within articulation of the mission, faculty members and their individual departments and disciplines must be able to identify and express to the institution at large what these commitments mean to them.

EDUCATIONAL LEADERSHIP

This study focused on faculty concerns and perceptions of facilitators, barriers and leadership interventions in implementing a mandated educational change to the teaching-learning process—the ITESM Educational Model—at the Mexico City campus of ITESM, Mexico. Leading an institution of higher learning with different stakeholder groups (e.g., trustees, faculty, staff, students, alumni) is a challenging task. Leading a mandated systemic change in higher education is complex and even more challenging. Therefore, educational leadership in higher education is a key topic within this study and will be addressed next by the researcher from the perspective of several authors.

Leadership and leader are words defined in different ways by numerous authors across time and circumstances. The researcher defines leadership as the human phenomenon—with the two-fold component of art and science—of guiding people to achieve specific purposes. Leadership involves guiding the actions that help a group accomplish its goals and maintain cooperative relations among members. As stated by Block (1987, p. 98), "Leadership is the process of translating intentions into reality."

The Merriam-Webster Dictionary (1994) has defined the verb “to lead” as: To guide on a way; to direct operations, activity or performance; to go at the head of; to tend to a definite result (p. 420). The Oxford English Dictionary notes the appearance of the word “leader” in the English language as early as 1300 A.D. The word “leadership”, however, did not appear until about 1800 A.D.

According to Johnson, Johnson & Holubec (1989), the concepts of leader and leadership have been defined in more different ways than any other concept associated with group structure. A preoccupation with leadership occurs throughout countries with Anglo-Saxon heritage. “When one reads the historical as well as the current literature on leaders and leadership, it seems as if there are as many different definitions as there are persons who have attempted to define the concepts” (Johnson, Johnson, & Holubec, 1989, p. 8:1).

Johnson, Johnson and Holubec addressed the leadership concept through different theories. These authors pointed out that throughout history, many people have believed that leaders are born, not made, and that great leaders are discovered, not developed. This is referred to as the trait theory of leadership. The leadership style theory suggests that even casual observation of leaders in action reveals marked differences in their styles of leadership (e.g., autocratic, democratic, *laissez-faire*). The influence theory of leadership defines a leader as a group member who exerts more influence on other members than they exert on him or her. Without followers there can be no leaders, and without a leader, there can be no followers. The position approach to leadership perspective determines leadership in organizations as the formal role structure that defines the hierarchy of authority or legitimate power. “To lead a school or school district, however, requires a more complex theory of leadership” (Johnson et al., 1989, p. 8:7). The researcher believes this assertion is also applicable to institutions of higher education.

Hord (1992) declared that the attention to leadership has been unprecedented in business and government, as well as education. She addressed the challenge that America’s schools face in making educational changes in order to meet new demands from society. Educational leadership is required as never before. Consequently, a better understanding of leadership for educational change is of the utmost importance to the profession.

Mendez (1992) has examined the history of leadership research and leadership skills from a variety of perspectives. Early analysis of leadership, from the 1900s to the 1950s, differentiated between leader and follower characteristics. At that time, studies found that no single trait or combination of traits fully explained leaders’ abilities. Researchers then began to examine the influence of individual situations on leaders’ skills and behaviors. Subsequent leadership studies attempted to distinguish effective from non-effective leaders. These studies tried to determine which leadership behaviors were exemplified by effective leaders. To understand what contributed to making leaders effective, researchers used the contingency model in examining the connection between personal traits, situational variables, and leader effectiveness.

Leadership studies of the 1970s and 1980s once again focused on the individual characteristics of leaders that influence their effectiveness and the success of their organizations. The investigations led to the conclusion that leaders and leadership are crucial but complex components of organizations.

According to Astin and Sherrei (1980), research has shown that leaders have different styles. A good combination of leadership styles can definitely create the proper conditions to overcome barriers and obstacles when educational innovations are introduced. These authors' analysis showed that student and faculty performance are related to four presidential styles (bureaucrat, intellectual, egalitarian, and counselor), and five administrator styles (hierarchical, humanistic, entrepreneurial, insecure, and task-oriented).

Benezet (1981) emphasized that leadership and college presidency styles will drive post-secondary institutions differently, and most styles are required during different stages of institutional systemic change. He described the different college presidential leadership styles as follows: (a) the take-charge, (b) the standards-bearer, (c) the organizational, (d) the moderator, (e) the explorer, and

(f) the founding presidents. The researcher of this study considers each style to have its own place in the process of educational systemic change. The redefinition and adoption of new educational paradigms require academic administrators to combine several leadership styles during different stages of the educational innovation's adoption process.

A unique approach to leadership-management styles within institutions of higher learning is the *Management Grid* (Blake, Mouton, & Williams, 1981) which has been modified, adapted, and perfected specifically for use by academic administrators. The management grid is a method of organizational development that has been used in both public and private organizations for almost two decades, and that was transferred to the academic setting to improve college and university administration. Within their management grid approach, these authors consider institutional performance and key players from a matrix perspective. Five major styles are depicted by the grid, distinguished by differences in the administrators' concern for institutional performance, on the one hand, and concern for people, on the other. The styles are described as caretaker, authority-obedience, comfortable and pleasant, constituency-centered, and team administration. Blake et al. (1981) suggested that team-leadership is the most effective way to support teaching and learning and to handle other related administrative tasks. Team administration has helped academic administrators to build and lead a more successful educational systemic change innovation.

Similarly, Bensimon (1993) referred to leadership as a team-oriented issue, not in terms of single individuals. She discussed the advantages and disadvantages of teamwork and emphasized the emerging model of the team as a culture. This premise of collaborative-interactive leadership focuses on learning as the most important activity throughout colleges and universities. Bensimon's leadership approach matches academic administrators' needs to build a cohesive, interactive, and collaborative learning environment among students and faculty. This approach seems to properly fit the requirements for an institution's system-wide educational change.

Hord (1992) suggested that facilitative change leadership is a neglected area in policy implementation, and the key factor in the process of educational change. She remarked that time and energy need to be devoted to this process. Individuals acting as change facilitators must provide facilitative leadership during the educational change process. From Hord's perspective, successful change of individuals' knowledge and practices in classrooms and schools appears to be accompanied by ongoing support and assistance as they implement the changes. "There is a distinction between management, which educational administrators typically carry out with reasonable success, and leadership, which educational administrators allegedly do not have, but should" (Hord, 1992, p. 87). Deal (1990) maintained that nothing will happen without leadership.

Educational change at all levels requires administrators to lead professors in the process of adopting academic innovations. Faculty need specific leadership interventions during different stages of a change process. Hord and Huling-Austin (1986) conducted a longitudinal study that focused specifically on identifying the actions or interventions of principals and other facilitators in teachers' implementation of educational change. Hord and Huling-Austin derived a six-component framework from their study. The most frequent interventions found in the study of school change were classified in the following categories:

1. Providing logistical and organizational arrangements,
2. Training,
3. Monitoring and evaluation, and
4. Providing consultation/problem-solving and reinforcement.

In addition, two other functions are prominent in the literature on change implementation, and were added by these authors to complete the six-part framework about leaders' roles in implementing change:

5. Creating an atmosphere and culture for change, and
6. Communicating the vision.

Mendez (1992) pointed out that leadership in promoting and implementing educational change has not been uniform. There has been minimal research on the qualities of individuals who have successfully implemented such change strategies. Nevertheless, data on leaders of educational change and emerging information on teacher leadership indicate that the characteristics of these individuals mirror those of leaders who have changed other organizations. Leaders of educational change have vision, foster a shared vision, and value human resources. In addition, they strongly believe that the purpose of educational institutions is to meet the academic needs of students.

Educational changes and innovations are implemented through different stages, requiring support and opportune communication. Dressel (1981) stressed that leaders are proactive, take risks, and are effective communicators. This author emphasized the importance of credibility and trust for effective leadership. When there is a lack of credibility and trust, communication may create crises rather than avoid them. Dressel described communication as a problem at every university campus. "No credence is given to the statements of one who is not trusted" (p. 49). The researcher of this study believes that this is especially true with faculty.

Lick (2002) suggests that the current higher education environment is changing rapidly. Although educational cultures are among the most rigid, this author suggests that visionary leadership and change creation have become increasingly important to the future of education. “Change creation is the primary challenge for higher education. The process of change creation is extensive, complex, and multifaceted” (Lick, *Field Guide to Academic Leadership*, 2002, p. 40).

IMPLEMENTING CHANGE CONCERNS

Change is a personal process and a significant component of every life journey. Changing the educational paradigm of an entire institution is a difficult process affecting different stakeholders: students, faculty, staff, administrators, trustees, alumni, and parents. “What many leaders see as resistance to change may in large part be grief over the loss of favorite and comfortable ways of acting” (Hall & Hord, 2001, p. 5). Educational change is required in the teaching-learning processes to better train college and university graduates to fulfill new and increasing demands from society. The adoption of an educational innovation represents a change process with different stages.

The literature has indicated that faculty and academic administrators have different perspectives of what facilitates and impedes the adoption of educational innovations. Given the academic administrator’s responsibility to lead the systemic educational change process, it is important for them to better understand faculty concerns and perceptions of facilitators, barriers and facilitative leadership interventions to successfully lead the process of educational innovation.

“Feelings and perceptions about the innovation and the change process can be sorted and classified into what we call *concerns*” (Hall & Hord, 2001, p. 57). There is a developmental pattern to how feelings and perceptions evolve as the change process unfolds, which has been termed the stages of concern. In 1973, Hall, Wallace, and Dossett published a paper hypothesizing that there were a set of stages of concern about an innovation that educators experienced whenever they were introduced to a new or different educational product or process.

This study used the *Stages of Concern Questionnaire* (SoCQ) to collect data for Research Question 2 (RQ2). This instrument was constructed by a team of scholars (Hall, George, & Rutherford, 1979) in the USA during the early 1970s to assess the concerns of teachers and college faculty with regard to the use of educational innovations. The SoCQ “is the most rigorous technique for measuring concerns” (Hall & Hord, 2001, p. 68) and consists of 35 items to which individuals respond on a 7-point Likert-type scale. The items were selected to represent the different types of concerns teachers and other educators have as they are first introduced to an educational innovation, begin to use it, and then move on to more experienced and mature perspectives and increased confidence in their use of the specific innovation.

The idea of calling one's feelings and perceptions *concerns* was originally proposed by Frances Fuller (1969). Fuller—an exceptional educator—came up with the idea of teachers having concerns, concerns that would change with increasing experience and maturity. "Fuller proceeded to conduct a series of in-depth studies of the concerns of student teachers. She then proposed a model outlining how, with increasing experience in a teacher education program, the student teacher's concerns moved through four levels: *unrelated, self, task,* and *impact*" (Hall & Hord, 2001, p. 58).

> The unrelated concerns are mostly found among student teachers without any direct contact with school-age children or clinical experiences in school settings. Self-concerns tend to be most prevalent when student teachers begin their student teaching or other more intense clinical work. They have concerns about teaching, but within an egocentric frame of reference. These expressions indicate a concern about teaching, but with a focus on the teacher rather than on the act of teaching or the needs of the children. Task concerns show up quite soon after the start of student teaching, as the actual work of teaching becomes central. Impact concerns are the ultimate goal for student teachers, teachers, and professors. (Hall & Hord, p. 59)

Fuller and her colleagues at the Research and Development Center for Teacher Education, The University of Texas at Austin systematically documented the kinds of concerns that pre-service teachers experienced as they progressed through their teacher education programs. From this work, the idea that teachers' concerns tended to move through a pattern from initial self concerns, to task and ultimately, impact concerns was a useful schema for understanding and making sense of the comments regularly heard from student teachers and others as they experienced teacher education. In her studies, Fuller (1969) found that over two thirds of the concerns of pre-service teachers were in the self, task, and impact areas. She also observed that at any given time, teachers might have concerns at several levels, but that they tend to concentrate in one particular area.

By the late 1970s, the research agenda on change at The Research and Development Center for Teacher Education at the University of Texas at Austin, had expanded from assessing the change process as experienced by individual teachers and college faculty—the users of educational innovations—to systematically examining the role of school principals and other change facilitators in higher education.

Evans and Chauvin (1993) highlighted the fact that researchers working at the University of Texas at Austin's Research and Development Center for Teacher Education have extended the pioneering work of Fuller to other educational settings, and have identified and defined seven developmental stages in relation to the implementation of innovations. Based on their extensive field work, an expanded version of Fuller's original concerns model was developed, resulting in seven Stages of Concern, summarized in Figure 2. "Knowing the stage(s) of concern experienced by an individual in relation to a particular innovation is important to facilitating that change" (Chauvin et al., 1993, p. 168).

Figure 2. Stages of concern: Typical expressions of concern about the innovation (Evans and Chauvin, 1993, p. 169)

Stages of concern	Expressions of concern
6. Refocusing	I have some ideas about something that would work even better.
5. Collaboration	I am concerned about relating what I am doing with what other instructors are doing.
4. Consequence	How is my use affecting students?
3. Management	I seem to be spending all my time getting material ready.
2. Personal	How will using it affect me?
1. Informational	I would like to know more about it.
0. Awareness	I am not concerned about it.

The Concerns-Based Adoption Model (CBAM)

The Concerns-Based Adoption Model (CBAM) "is an empirically-based conceptual framework which outlines the developmental process that individuals experience as they implement an innovation and participate in staff development" (Hord, 1987, p. 12). The CBAM offers a number of important ways for understanding what change is about, especially as it relates to those involved. The CBAM is based on a number of assumptions about educational change:

1. Change is a process, not an event.
2. Change is accomplished by individuals.
3. Change is a highly personal experience.
4. Change involves developmental growth.
5. Change is best understood in operational terms.
6. The focus of facilitation should be on individuals, innovations, and the context. (Hall & Hord, 1998, p. 6)

The concerns-based approach addresses key aspects of the change process and provides advice for achieving a higher level of successful implementation of educational innovations. Concerns about the innovation was proposed in the CBAM as one of the key diagnostic dimensions that change facilitators should consider in designing educational interventions. The CBAM differs from other models in its primary focus on the people at the "front lines" (e.g., faculty and staff) who have to implement the expected educational change. The secondary focus is on how leaders can and do facilitate change or how leaders can obstacle educational change.

By the late 1970s, Hall, Newlove, George, Rutherford, and Hord's research agenda shifted to examining how individuals' external to front-line use of the innovation were affecting classroom practice (Hall & Hord, 1991). "The generic role of *change facilitator* was defined to represent the diverse set of persons, within and outside of organizations, who have the formal or informal role to aid those involved in learning to use innovations" (p. ii). They concluded, "change facilitators have *concerns* about their roles that in many ways have the same dynamics as the concerns of teachers about their use of an innovation" (p. iii).

Hall et al. (1991) note that it became important to better understand facilitators' concerns in order to determine how these concerns influence their actions and ultimately, the implementation of educational innovations. Knowledge of facilitators' concerns could help facilitators become more effective in their role. When confronted with change, there is a natural tendency to focus on how to defend the current situation instead of on how to use change and succeed with it. "Leaders of educational change should be much better at attending to the needs of the people—faculty, students and staff—involved and preventing much of what often goes wrong" (p. xv).

Hall et al. (2001) emphasized that "at all levels—the individual, organizational, and system—change is highly complex, multivariate, and dynamic. If it weren't so complicated, it would not be nearly as much fun to study, facilitate, and experience" (p. 4).

> Change is not accomplished by having a one-time announcement by an executive leader, a two-day training workshop for teachers in August, and/or the delivery of the new curriculum/technology to the school. Instead change is a process through which people and organizations move as they gradually come to understand, and become skilled and competent in the use of new ways. It takes time

> to achieve change. Our research and that of others documents that most changes in education take three to five years to be implemented at a high level. (Hall et al., pp. 4-5)

Hall and Hord (2001) observed that the CBAM makes important assumptions: Change is a process, and the plan for change must be strategic in nature. Educational policies need to address the need for multi-year implementation support. “Implementation takes time and often, during the first or second year of implementation, innovation participants reach the wrong conclusion that the new approach does not work, when in fact there was not enough time and/or support for implementation” (Hall et. al, 2001, p. 5).

“Development and implementation are two sides of the same coin. Development comprises all of the activity related to creating an innovation, while implementation addresses establishing the use of innovation at adopting sites” (Hall et al., 2001, p. 6). This creates an undesired imbalance, since attention and investment are heavily loaded on the development side, and fail to acknowledge that implementation requires an equal investment of time and money.

> Change facilitators on the development side tend to be very visible and dynamic, and implementation facilitators on the development side need to have the patience to work daily with teachers who are attempting to figure out how to use the innovation. Leaders on the development side, such as policymakers, often lose interest once development is done and implementation begins. They are ready to move on to the next initiative, which frequently leads to loss of support for the implementation of the first initiative. By contrast, change facilitators on the implementation side need to have a great deal of patience and persistence. (Hall et al., 2001, p. 7)

The concept of concerns is a useful way to understand the highly complex and dynamic state of emotion and thought that people have in relation to a given educational change or innovation.

PROFESSIONAL DEVELOPMENT: A STRATEGY FOR IMPLEMENTING CHANGE

Educators and researchers have agreed on the importance of faculty training and development to the success of implementing educational innovations. Faculty development is one of the most important aspects of educational systemic change, because it is at the professorial level that teaching and learning practices actually change. Colleges and universities have recently shown a strong interest in faculty professional development because their faculty members now face more pressure than ever before to change their teaching styles.

As Kolbo and Turnage (2002) stated, for institutions to remain at the forefront of higher education, faculty development initiatives are of prime importance. In a move to enhance academic excellence through faculty development in higher education, Kolbo and Turnage recommended that faculty development initiatives (a) expand their focus, (b) employ a wider variety of methods and delivery formats, (c) focus on the delivery of learner-centered instruction, and (d) consider the potential cultural impact of technology.

> Faculty development encompasses a broad range of programs and activities designed to support teaching and learning at all levels

> (undergraduate, graduate, doctoral) and in all contexts in which instruction occurs. These may range from a focus on an individual faculty member improving his/her instructional skills to advocacy for campus-wide changes in policies that determine faculty roles and rewards. Faculty development programs may include, but are not limited to, general or pre-service orientations; workshops and in-service training; seminars or forums; consultations; handbooks, newsletters, or training letters; short courses or weekend institutes; and mentoring initiatives. These programs also may deliver their content in a variety of forms, such as written documents, face-to-face contact with individuals or small groups, video conferencing, or other electronic presentations. (Kolbo & Turnage, 2002, p. 102)

On a global level, UNESCO (2001) offered 15 recommendations in its World Declaration on Higher Education. These recommendations included addressing faculty development, stressing the importance of efforts to "update and improve the skills of teachers in higher education, with stimulus for constant innovation in curriculum, teaching and learning methods" (UNESCO, 2001, p. 13).

In *Faculty Development for Learning* (1989), Thomas Angelo emphasized the importance of faculty development in improving the quality of learning in higher education. Angelo dismisses faculty development's traditional approach to teaching and teachers, and suggests focusing on learners and learning. The author explains why faculty developers should make learning improvement their primary goal, and determines seven barriers to more widespread and effective faculty participation in teaching and learning improvement programs. Once the barriers to faculty involvement have been recognized, the challenge is to overcome or lower them. Additionally, Angelo offers seven guidelines for more effective faculty development in improving teaching and learning. “The driving concept is focusing on improving learning as the primary goal, and on improving teaching as one means to achieve that goal” (Angelo, 1989, p. 46). This author categorizes faculty development programs to improve teaching and learning into five broad approaches: (1) Inspiration/Information, (2) Rewards and Recognition, (3) Specific Skills Training, (4) Clinical/Research Consultation, (5) Peer-Coaching/Mentoring, and (6) Classroom Research.

Saroyan, Amundsen, and Li (1997) refer to teaching at the post-secondary level as a complex activity rather than a set of specific skills. That is, teaching is defined not only by overt actions but also by beliefs, views, and assumptions held about teaching (Calderhead, 1991; Elbaz, 1991; Kagan & Tippens, 1993; Ramsden, 1992). Within this perspective, attaining a level of teaching competency, as a minimum, calls for an integrated view of the subject to be taught, the role of the learner and the teacher, and ultimately, the desired learning. These authors seek to demonstrate the way in which faculty development interventions can promote such a complex view, and to provide some preliminary evidence as to the effectiveness of such development programs offered in different formats.

The Ramsden (1992) framework is considered to be the most comprehensive among the existing bodies of literature useful in detailing the design of faculty development programs in higher education that aim to change individuals' thoughts as well as their actions.

> The answer to improving student learning lies in the connection between students' learning of a particular content and the quality of our teaching of that content. Good teaching and good learning are linked through the students' experiences of what we do. It follows that we cannot teach better unless we are able to see what we are doing from their point of view. (Ramsden, 1992, p. 86)

A useful perspective on faculty development is offered by Ben Ward (1995). Ward refers to McKeachie's (1990) comprehensive review of the history of research on college teaching across the 20th century, identifying five areas that have been the focus of research: class size, teaching/learning methods, evaluation of teaching, teaching and technology, and cognitive psychology. "Most of this research has focused on teaching methods and evaluation, particularly student rating of instruction" (p. 29).

Ward (1995) focuses on a few studies helpful in identifying some of the factors involved in the process of improving teaching. He reports that these factors may be classified into the following three categories: (1) driving forces, (2) neutral forces, and (3) restraining forces. The driving forces—factors which tend to support the improvement of teaching—include: (a) faculty intrinsic motivation, (b) teaching consultation services, and (c) a positive institutional climate for teaching. Neutral forces include faculty career age, end-of-course student ratings, and the institutional reward system. The restraining forces considered are (a) low perceived need to improve teaching among faculty, and (b) negative institutional climate for teaching. “While these factors probably do not represent all of the forces involved in the complex process of improving teaching, they provide a useful starting point for understanding the process of improving teaching on a broad scale” (Ward, 1995, p. 32).

Turner and Boice (1997) suggested that faculty developers, like the professionals they serve, are susceptible to dysfunctional, job-related stress and diminished enthusiasm for their work. One source of job dissatisfaction for developers lies in the resistance encountered in attempting to present services and programs to faculty. Traditional notions about resistance derive from the dynamics of client/therapist interaction (Ellis, 1985; Strean, 1985). Typically, clinical literature on the subject identifies three issues in understanding and coping with resistance. The first issue is the realization that resistance can reveal important information about the individual’s needs and suggest forms of intervention. The second issue is the need to develop an objective perspective that helps minimize personal reactions to the aversive properties of resistance. The third issue is to recognize that the providers of help or services can contribute to their own problems by unnecessarily eliciting resistance. Turner and Boice offer a useful summary of typical kinds of resistance to faculty development encountered by deans and chairs as they respond to new program offerings. According to these authors, the most common respondent objections were as follows:

1. "Faculty are too busy to participate in faculty development!"
2. "The only program faculty want is released time for teaching."
3. "They've either got it or they don't."
4. "Your programs raise issues about faculty's rights to privacy, autonomy, and academic freedom."
5. "Faculty don't want help."
6. "How do you know it works?" (Turner & Boice, 1997, pp. 28-29)

Turner and Boice proposed using the model of clinical resistance as a means of generating possible solutions.

Eison and Stevens (1996) address faculty development workshops and institutes as a popular means of faculty development. Among the many types of faculty development activities, rationale for the use of workshops and institutes is found in many sources. These authors summarize: "Faculty developers believe that the greatest potential for improving the quality of teaching lies in workshops for targeted groups and conferences on teaching and learning open to faculty from all disciplines" (p. 209). There is increasing evidence in the literature of higher education that undergraduate professors discuss their teaching and that workshops and institutes are widely used by faculty developers to simulate and structure faculty conversations about teaching.

> Skillfully planned and implemented workshops and institutes provide an efficient and cost-effective opportunity to introduce faculty to the art, craft, science, and research on effective teaching. Furthermore, such events enable facilitators to model and demonstrate effective instructional practices while similarly providing participants with opportunities to share with and learn from faculty colleagues teaching in other disciplines. (Eison & Stevens, 1996, p. 224)

Ranging from 90-minute workshops to a ten-day summer institute, productive conversations about teaching can be organized for large interdisciplinary groups or small discipline-based units within these programs.

During a summer institute for ITESM faculty in 2001, Professor Marilla Svinicki from the College of Education at the University of Texas at Austin, addressed key issues on faculty development. Svinicki (2001) considered alternative methods/models for introducing educational innovations. Direct teaching models include: (1) formal training by an expert model, (2) the train the trainer model, (3) the online or materials-based model, and (4) the mentoring model. The study group model, support group model and classroom research model constitute different approaches to group collaboration models. The expert resource model, the resource team model and the idea of certain model combinations were also presented. Svinicki also described how to choose a model taking into consideration past successful innovative projects.

Svinicki (2002) declared that higher education administrators are facing numerous challenges associated with educational change, accountability and technology. *In Faculty Development: An Investment for the Future* (Diamond, 2002), Svinicki emphasizes the importance of faculty and staff development. “You are much more likely to be interested in hearing about where to spend your institution’s time and resources in coping with these forces. I am going to try to interest you in spending it where you will get the best return on your investment: the human capital of every institution, its faculty” (p. 211). According to Svinicki, faculty and instructional development programs have the potential to enhance colleges’ and universities’ growth if they have a proper combination of support, goals, staff and patience.

Hord (1994) suggested thinking about staff development as a process for change. She asserted that successful strategies for a comprehensive approach to changing teachers’ practices should include developing and articulating a vision, planning and providing resources, investing in training, monitoring progress, providing ongoing assistance, and creating a context conducive to change.

Interestingly, faculty adoption of innovations at institutions of higher education has been a voluntary and isolated process. The understanding derived from voluntary adoption of technology in the teaching-learning process can help academic administrators understand key motivations for adopting educational technology at the faculty level, and how to facilitate the process when the process of adoption of technology-assisted teaching and learning is mandated. Successful faculty development programs can direct us to key factors that facilitate any educational change process. Faculty experience a deep transformation in the process of understanding and implementing student-centered technology-assisted teaching and learning.

Following are two documented examples of educational innovations in different settings.

USING TECHNOLOGY AS A CATALYST FOR SYSTEMIC CHANGE: EXAMPLE 1

Burns and Menchaca (2000) describe a longitudinal study on the transformation process of using technology as a catalyst in specific learning communities. Emphasis is made on faculty perceptions of facilitators and barriers in adopting distance learning. The *Applying Technology to Restructuring and Learning* (ATRL) model developed at the Southwest Educational Development Lab (SEDL, Austin, TX) assisted teachers in moving from a low student-centered approach to classrooms in which students' use of technology was a regular practice (up to 80%).

> …beyond the dry statistics was the vivacity of many of these once lifeless classrooms. Teachers were not just complying with the project's expectations; in most instances they were exceeding them and seemed truly committed to this new mode of instruction. They were facilitators, mentors, educational producers; students were

> active and engaged actors in the learning production. The shrouds had been removed from the computers, which now functioned as essential learning tools (for students and teachers) for research, problem solving and creative expression. The distance between teachers and students—academic, emotional and physical—had been bridged as teachers became co-learners with students. Autonomy, decentralization and responsibility appeared to be the defining instructional ethos. In short, the classrooms were exciting incubators for learning and collaboration and a feeling of *esprit de corps*, a partnership for learning, prevailed. Teachers reported that students' work was better, discipline problems had diminished, and many confided that they enjoyed teaching again for the first time in many years. One eloquently encapsulated the changes we were seeing at a particular campus: "We had to learn how to learn again; we did it and we loved it. We have become a learning community and have deeply influenced our students. Now they have become a community of learners too". (Burns & Menchaca, 2000, p. 3)

The strength of the ATRL model of professional development is that *learning* and *teaching* are both used as organic and complementary processes. Such a model demands a delicate balance from the professional development provider; it also demands a new approach towards professional development that focuses not on how much is *taught*, but on how teachers learn. In the process of helping teachers become committed to new ways of teaching and learning, "teachers were provided with time to learn and encouraged to focus on themselves and their students as learners. They were given time to make mistakes, to focus on process, to explore new options, to get frustrated and angry, to work with their colleagues to find a solution, and to reflect on the process of learning and teaching" (Burns & Menchaca, 2000, p. 15).

The ATRL study focused on technology as a catalyst for change within a school environment. Yet there were other factors in place necessary for teachers' shift in practice: administrative support; a genuine desire, willingness or at least openness on the part of the teacher to change practice; the relationship between the SEDL facilitator and teachers; and time within professional development sessions to work on applying what was learned. "Yet technology, because it was such a crucible for teachers, assuming an almost metaphoric importance, was the catalyst for teachers' re-imagining themselves as co-learners with colleagues and students"(Burns & Menchaca, 2000, p. 15).

FACULTY ADOPTION OF TECHNOLOGY IN DISTANCE EDUCATION: EXAMPLE 2

Kristen Betts' (1998) Distance Education (DE) study of faculty and the adoption of technology provides useful insights into the complexity and the multitude of factors that can facilitate faculty adoption of teaching with technology. Betts found that intrinsic factors positively influenced faculty participation in DE, while extrinsic factors did not significantly influence participation. In this study, the participants were faculty aged 45 years and older. Faculty in non-tenure accruing positions were found to be the most active in DE. Gender, rank, and tenured/non-tenured status were not found to influence faculty participation. Schools with deans with DE teaching experience and/or positive attitudes toward DE had larger percentages of faculty participating in DE.

Significant differences were found between factors that "have motivated" participants to participate in DE and factors that "would motivate" them to continue and/or increase their participation. No significant differences were found between what faculty identified and deans perceived as factors that would motivate faculty to participate in DE. However, significant differences were found between what faculty identified and deans perceived as factors that would inhibit faculty from participating in DE.

The development of distance education in higher education requires a renewed commitment by American higher education institutions to their most important resource – faculty. "Using technology in education involves more than just the physical infrastructure of an institution. It also involves the human infrastructure" (Daigle & Jarmon, 1997, p. 35).

SYSTEMIC CHANGE EFFORTS IN A HIGHER EDUCATION INSTITUTION

Society's new demands on higher education are challenging traditional educational models and specifically, the traditional concept of teaching and learning. Changing the teaching-learning paradigm in post-secondary institutions is a very complex issue, much more so than other changes, demanding a holistic-based, systemic effort.

Colleges and universities are now required to prepare professionals/graduates able to meet increasing and complex demands in a fast changing society. As indicated in Chapter 1 (p. 5), there is growing recognition of the need to change the traditional teaching-learning paradigm in higher education. The need for change is particularly compelling based on the recognition that the traditional teaching-learning paradigm is no longer the most effective strategy for preparing students to develop the skills and knowledge they need to be successful in a 21st century knowledge-based global economy. Besides updated blocks of knowledge, college graduates are required to think critically, to learn how to learn, to solve problems, to make decisions properly, and to show integrity and respect, among other attributes.

Consistent with this trend, the Monterrey Institute of Technology and Higher Education (ITESM) is in the process of renewing and changing the university's teaching-learning paradigm in Mexico. The ITESM has initiated a comprehensive, long-term, and large-scale effort to change the teaching-learning paradigm and to infuse technology into all aspects of the teaching-learning process. This educational change mandated by the administration is referred to as the ITESM Educational Model. The process of systemic educational change at the ITESM is a unique example of an institution that has been recognized internationally for its ongoing effort to mandate and support changing the teaching-learning process throughout the entire system of 33 campuses (Resta et al., 2003).

The annual edition of IQ Magazine (November/December 2003) has recognized ITESM as one of the world's leading institutions in the effective use of technology, and for its Information Technology (IT) infrastructure. The MET uses technology to enable didactic processes that allow the students to work collaboratively and solve problems.

The ITESM initiative provides a unique environment in which to study and to better understand the faculty perceptions and experiences of the educational change processes, and to identify the perceived barriers and drivers of change within a higher education system. The ITESM case is an example of large-scale systemic change in higher education. A summarized description of ITESM will be presented in the next section.

The ITESM System: The Research Setting

The Monterrey Institute of Technology and Higher Education (ITESM) was founded in 1943 in Monterrey, Mexico, as a private, non-profit institution of higher education. It is now a nationwide university system, accredited since 1950 by the Southern Association of Colleges & Schools (SACS) in the United States. ITESM has 102,400 students (ITESM Annual Report, 2003) enrolled in the high school, 34 undergraduate programs, 49 master's programs, 12 doctoral programs, nearly 3,500 international students, and approximately 8,000 professors seeking to equip students with the knowledge and skills needed to succeed in today's business world (www.itesm.mx/sistema/somos).

Several programs offered by ITESM have been accredited by agencies such as the ABET (Accreditation Board for Engineering and Technology), the AACSB (Association to Advanced Collegiate Schools of Business), the NAAB (National Architectural Accreditation Board), and the EQUIS (European Quality Improvement System). ITESM is supported by 450 board members and 152,000 alumni.

ITESM is now the largest private institution of higher education in Latin America and is a leading nationwide educational system of international scope with 33 campuses (i.e., component institutions) in 29 cities throughout Mexico. The ITESM system also operates 16 offices across Mexico and 8 subsidiary offices in Latin America—Venezuela, Ecuador, Peru, Colombia, Chile, Panama, Honduras, and Bolivia (ITESM Annual Report, 2003).

In accordance with ITESM's technological orientation, the institution has developed and offered courses through its Virtual University since 1986. The Virtual University (www.ruv.itesm.mx) is a unique technology-based distance education system serving Mexico, Central and South America, the United States, and Canada. Video satellite transmissions and online learning activities support thousands of students at the undergraduate and graduate levels. In addition, ITESM's Virtual University offers continuing education in different fields.

Consistent with the ITESM strategy of internationalization, the institution operates subsidiary offices in Miami, Florida; Dallas, Texas; Washington, DC; Vancouver, Canada; Québec, Canada; Paris, France; Madrid, Spain; Singapore; and Shanghai, China. Through the ITESM's Virtual University, undergraduate and graduate students can take some of their courses via the Internet, taught with didactic methods mandated by the ITESM Educational Model. An intense development effort is underway to offer master's and doctoral programs in areas where ITESM is strongest, including administration, education, humanities, and engineering. The ITESM's Virtual University offers training to educators, public administrators, small businesses, transnational companies, and Hispanics in the United States, with future plans to offer courses on the methodology of the ITESM Educational Model to faculty at other institutions.

In order to fulfill its mission of training individuals committed to the social, economic, and political improvement of their communities and to be internationally competitive in their field of knowledge (ITESM, 1998), ITESM decided to adopt a new educational approach based on a collaborative and constructivist learning philosophy (Jonassen, 1996; Johnson, Johnson, & Holubec, 1989; Maddux, Johnson, & Willis, 1997). In 1995, ITESM adopted a mission to systematically change its teaching and learning process by the year 2005.

ITESM Mandated Systemic Educational Change

The ITESM is engaged in systemic educational change, with all community members experiencing and participating in the change process at many different levels of the system. This Mexican post-secondary institution has undertaken the huge challenge of transforming the teaching-learning process across its entire 33 campuses. Such an effort is unprecedented and involves systemic change efforts on a massive scale. A system-wide paradigm shift in the teaching-learning process requires a combination of effective change strategies, professional development, and leadership and support to facilitate the educational change process and to overcome resistance and barriers to change. A critical component of the ITESM's change process has been to help faculty integrate online and face-to-face collaborative learning into their instructional practices (Resta et al., 2003).

The ITESM change process started with a vision by the institution’s leaders to achieve change with advocacy. The process began with a nationwide consultation and assessment of global and Mexican society’s needs. The change vision was based on needs expressed by all the stakeholders, including alumni, business leaders, faculty, students, staff, administrators and the board of trustees, a total of approximately 12,000 individuals. The change vision also considered results from a field research study on ITESM alumni in which cross-referenced professional trends and achievements for different classes were obtained. Finally, the vision incorporated worldwide educational trends and challenges, as well as business requirements for higher education.

In addition to the international and national educational demands, the results of the consultation done to the society were incorporated. In this research it was found that that Tec's graduate students are distinguished by the following:

- They show a relevant participation in the country's leadership.
- They occupy different positions in their professional life.
- They are distinguished by their entrepreneur spirit.

These data show that during their professional life, graduate students face situations that require knowledge and skills which are different from the ones they acquired at school. This phenomenon, which is derived from the conditions of the work market in the last decades, shows the need to develop in students the ability to learn by themselves. Consequently, the following goals in which the Tec can collaborate to benefit its country were identified:

- Creation of jobs
- International competitiveness
- Democratization

- Improvement of education (Martin, 2002, p. 6)

The ITESM 2005 mission statement defined the profile of personal qualities, attitudes, and values of the desired graduate in the following way:

1. Internationally competitive in their field of knowledge (Martin, 2002, p. 27)

2. Committed to the social, economic, and political improvement of their communities (Martin, 2002, p. 27)

3. Able to engage in self-directed learning, analysis, synthesis and evaluation, creativity, problem identification and solution, decision-making, team work, high-quality work, efficient use of computer science and telecommunications, correct use of English, and good oral and written communication. (Martin, 2002, p. 29)

4. Also, the desired graduate will have developed the following attitudes and values: honesty, responsibility, entrepreneurial spirit, work culture, commitment to sustainable development, commitment to be a change agent, respect for other persons' dignity, and a vision of an international environment. (Martin, 2002, p. 29)

Based on the data collected and analyzed in the global needs assessment, the ITESM system chancellor, the highest executive in the ITESM system, expressed an institutional commitment and became an advocate for the new ITESM Educational Model.

The ITESM adopted a technology-assisted teaching and learning model in order to help students develop as mandated by the 2005 mission statement. The technology-assisted teaching and learning process can best be described as student-centred, technology-assisted, interactive, collaborative, and contextualized e-learning supported by specific didactic methods. The ITESM educational paradigm builds on a collaborative teamwork philosophy that is supported by an advanced technology platform, promoting the development of strong skills in telecommunications and information technology. Course components are designed to promote deep, active, engaged learning in an authentic collaborative context. Didactic methods are appropriate to the content area, including case-based, problem-oriented, project-based, and collaborative learning approaches. Inquiry-based learning is used to build self-directed learning skills in addition to collaborative teamwork skills, promoting information exchange between students.

The MET is based on specific characteristics that all high school and undergraduate courses taught at ITESM must have, regardless of the level or discipline. These key characteristics are:

- Students learn to work collaboratively
- Students acquire relevant and deep knowledge
- Students direct their own learning process
- Students improve their learning process through continuous evaluation
- Students rely on Information Technology (IT) to enhance their learning (Martin, 2002, pp. 22-29)

The ITESM system has a hierarchical leadership structure shaped by a unique institutional culture. Once the mission was set in place, change was mandated. Mandated change is the opposite of the democratic decision-oriented approach to changing fundamental beliefs and teaching practices recommended by the notion of ownership of a shared vision of a new educational system (Jenlink et al., 1996).

Hall and Hord (2001) state that mandates can work. A mandate is one kind of strategy that is used widely in educational change. Although mandates are continually criticized as being ineffective because of their top-down orientation, they can work quite well. "With a mandate the priority is clear, and there is an expectation that the innovation will be implemented. When a mandate is accompanied by continuing communication, ongoing training, on-site coaching, and time for implementation, it can operate quite well" (p. 14).

Adopting large-scale mandated change is a difficult and challenging process in uncharted territory, for what we know about educational change is that it is more often than not driven by isolated innovative voluntary faculty efforts (Resta et al., 2003).

The ITESM Professional Development Program

A critical component of the ITESM's educational change process has been to help faculty transit from the traditional role of knowledge transmitters to the active role of facilitators in new environments, integrating online and face-to-face collaborative learning into their instructional practices. Professional development has therefore been one of the key strategies propelling the implementation of the ITESM Educational Model. From the beginning, full-time and part-time faculty within the high school and undergraduate educational levels were required to complete the institutional program *Faculty Development of Teaching Skills* (FDTS).

ITESM's current FDTS program is an intensive (Option A: 185 hours for full-time professors and Option B: 127 hours for part-time professors), multiple-stage transformational program designed to help faculty experience, learn about, and integrate online and face-to-face collaborative learning into their instructional practices. The program provides faculty with the opportunity for in–depth understanding of at least one of the following didactic methods: project-based learning (PBL), problem-oriented learning (POL), collaborative learning (CL), and case-based methods. The program also assists faculty in the implementation of their course modules on one of the Web platforms in use: Learning Space, Blackboard, or the ITESM's custom-designed environment, Web-Tech.

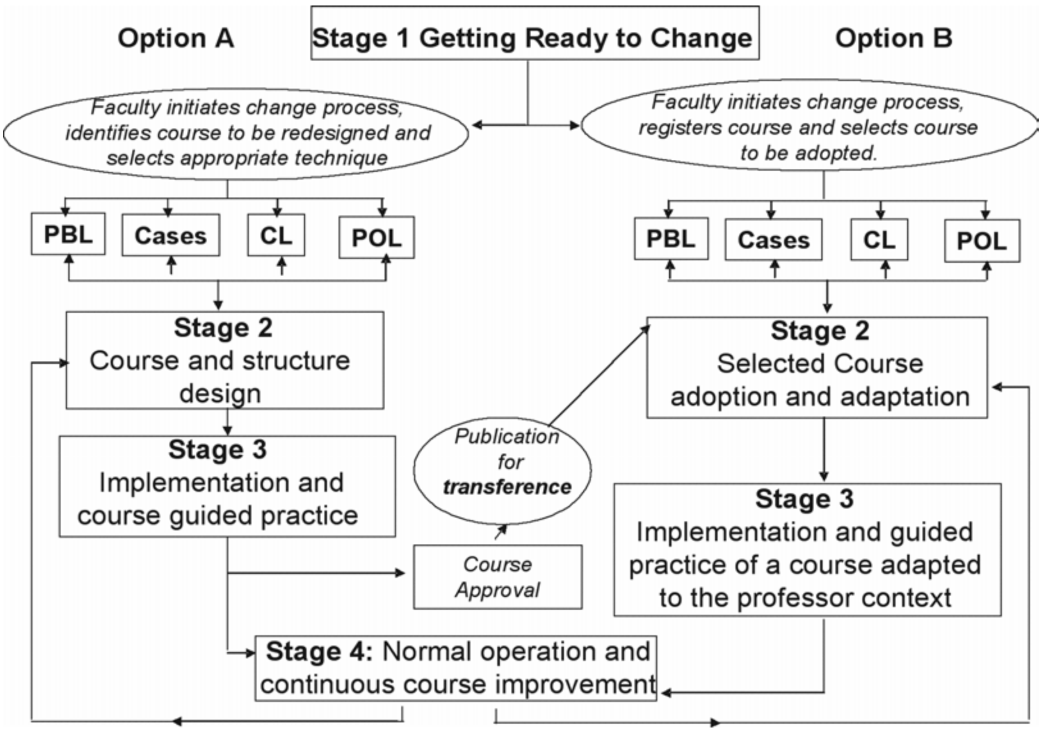
The structure of the program has as its main goal to develop an educational project through the planning, design, implementation, and evaluation of a course with the characteristics of the educational model. The PDHD also incorporates courses and workshops which support the development of the project in each phase. This process includes activities which are divided in two options:

- *Option A*: for professors who develop a course using the educational model in a technological platform. Professors implement, evaluate, and prepare the necessary didactic documentation so other professors can use it as a model.

- *Option B*: for professors who adopt a course developed by a colleague and which was approved and published in a technological platform. (Martin, 2002, p. 113)

Figure 3 provides a summarized illustration of ITESM Program for Development of Teaching Skills (FDTS).

Figure 3. ITESM program for the development of teaching skills (Resta, Johnson, De Hoyos, & González, 2004)



Faculty began redesigning their courses supported by staff associated with previously-established learning technology centers at each campus in the ITESM system. Half of the courses system-wide now use one or more of the didactic methods appropriate to the MET.

Resources were heavily invested in professional development abroad for faculty. The vice-president for academic affairs contacted world experts on the application of didactic methods. Experts on collaborative learning in British

Columbia (Canada), Minnesota (USA), and Texas (USA) were contacted and made institutional collaborative agreements. Other institutions collaborated in problem-based learning, project-oriented learning and case-based learning, and agreed to train ITESM faculty (Martin, 2002).

Although administrators were meant to lead the change process, no intervention was specifically arranged for them on how to become a change agent, how to assist faculty with the new instructional strategies, or how to address other faculty needs. A special intervention occurred in 2002 to help more than 500 top level administrators (campus presidents, academic deans, division heads, and department and program chairs) examine their leadership style and make them aware of the advantages of transformational leadership in a systemic change process. The meetings created an opportunity for leaders to share their experiences of the challenges within the systemic change process, and to engage in joint problem-solving and intra-institutional collaboration, with the underlying philosophy that everyone is a change agent – board members, rectors, administrators, faculty, and students. The time spent revising change management strategies, analyzing the implementation challenges to collaborative work teams, and using group intelligence to brainstorm solutions and share success stories of their campuses increased interconnection and contributed to increased system-wide collaboration and interdependence.

There are few examples of large-scale, high-intensity, sustained faculty development as part of a strategy to systemically change the teaching-learning process within a large educational system. The process of systemic change at the ITESM is a unique example of an institution that has been recognized internationally for its ongoing effort to mandate and support change of the teaching-learning process throughout the entire system of 33 campuses (Resta et al., 2003).

Interestingly, the Institute of International Education (IIE)—one of the world's most experienced global higher education and professional exchange organizations, based in New York, USA—conferred upon ITESM the Andrew Heiskell Award in 2004 for innovation in international education. Within the Outstanding Faculty Program award category, the IEE (www.iie.org) recognized the ITESM's Faculty Training Program for encouraging faculty to teach or conduct research abroad and integrating their overseas experience into home campus teaching (www.iienetwork.org/?p=39499). These awards recognize international education programs that are making a real difference in the lives of the students and communities they serve.

The Mexico City Campus of ITESM

The Mexico City campus of the ITESM system is the second-largest branch of the institution. It was founded in 1973 as a graduate school of business in downtown Mexico City. In 1990, the university campus was established in the southern region of Mexico City and initiated academic activities at the high school and undergraduate educational levels. In 2003, this campus had an enrolment of 11,854 students who received instruction from approximately 980 faculty members (ITESM Mexico City Annual Report, 2003). ITESM Mexico City offers a variety of academic programs at the high school level and undergraduate level through its School of Engineering and Architecture, School of Business Administration, and School of Humanities and Social Sciences (i.e. Liberal Arts). ITESM Mexico City also offers master and doctoral programs in Computer Science, Engineering, Administration, Finance, Public Affairs, and Humanities. The Mexico City campus is the flagship component institution of ITESM within this metropolitan area. This campus is currently propelling the institutional agenda throughout the implementation of two strategic academic initiatives: (a) ITESM Mexico City Graduate School of Public Affairs, and (b) ITESM Mexico City Graduate School of Business.

SUMMARY

This chapter provided relevant background to the study's literature review and the specific research setting. Following a brief historical overview of higher education, the researcher addressed the evolution of colleges and universities and their teaching methods since the 13th century. These teaching methods—referred to as traditional, lecture or directed instruction—have remained virtually the same throughout several centuries.

But now, higher education is undergoing a fundamental transformation, from the Middle Ages and the Industrial Age to the Information/Digital Age, in order to meet new and increasing demands from a fast changing society. This transformation has evolved into new educational paradigms seeking to convert colleges and universities from institutions that provide instruction to institutions that promote learning: The focus of the new educational approach appears to have shifted from teaching to learning. A comprehensive comparison between these two educational approaches is provided in this chapter.

Market forces, global competition, the power of technology, changing demographics, government influence, economics and other worldwide factors bring threats and opportunities to colleges and universities. Institutions of higher learning are required to respond to the world's fast changes and challenges with new educational models and with the infusion of technology into their learning environments. Although Information Technology (IT) has brought about many opportunities to enhance student learning, university professors need help in transitioning from roles as information transmitters to roles as facilitators of learning. To support faculty in this type of educational change, academic administrators need to act as facilitative leaders.

Effective transformation of the teaching-learning processes in post-secondary institutions requires these educational changes to become systemic; comprehensive changes affecting and pervading all components and levels of educational systems. Such educational transformations need effective leadership in institutions of higher education engaged in new ways of teaching and learning.

After describing the Concerns Based Adoption Model (CBAM)—a conceptual framework supporting the study's Research Question 2 (RQ2) and Research Question 3 (RQ3)—the researcher examined faculty professional development as a strategy for implementing educational change. Faculty and instructional development programs have the potential to support colleges and universities educational changes and to enhance students learning. Professional development may be employed as a vehicle for transiting from a teaching institution to a community of learning.

Institutions of higher learning are now being challenged to prepare graduates able to think critically, able to learn how to learn, to solve problems, to make effective decisions, to show integrity, solidarity and respect, and also to provide students with significant blocks of knowledge in a variety of disciplines. Consistent with this trend, the Monterrey Institute of Technology and Higher Education (ITESM) is in the process of renewing and changing the university's teaching paradigm in Mexico and has initiated a comprehensive, long-term, and large-scale effort to change the teaching-learning process mandated by the administration. The process of systemic educational change at ITESM—the implementation of the ITESM Educational Model—provides a unique example of an institution that has been recognized for its ongoing effort to support the educational paradigm across all campuses of the system.

In the next chapter, the study's research methods and procedures will be provided.

Chapter 3: Methodology and Procedures

INTRODUCTION

The purpose of this exploratory study was to analyze faculty concerns and perceptions of facilitators, barriers and leadership interventions in implementing a mandated systemic educational change to the teaching learning process—the ITESM Educational Model—at the Mexico City campus of the Monterrey Institute of Technology and Higher Education (ITESM), headquartered in Monterrey, Mexico. Previous chapters have outlined the need for this investigation and have examined related literature associated with the research. In this chapter, the study's research methods and procedures are described. First, the study's objectives and research questions are provided. The study's research inquiry perspective and selected methods are then detailed followed by the study's instrumentation and population of interest. Finally the study's participants, data collection and analytical procedures are described.

OBJECTIVES OF THE STUDY

In order to address the purpose of this study, the researcher specifically sought to pursue the following objectives: (a) acquire a deeper level of understanding of faculty perceptions of facilitators and barriers in implementing a systemic educational change process mandated by the administration, (b) identify and analyze faculty levels of concern regarding adoption of the mandated systemic educational changes in the teaching-learning process across different stages of implementation, and (c) examine faculty perceptions of change management and leadership interventions that facilitate the implementation of the mandated changes to the teaching-learning environment. The term "mandated systemic educational change" refers in the study to the implementation of a student-centered, technology-assisted teaching-learning process commonly referred to as the ITESM Educational Model (MET).

The examination and comparison of faculty concerns and perceptions should provide a deeper level of understanding of the issues, challenges, and required actions for successfully leading systemic change in higher education.

Research Questions

The purpose and the specific objectives of the present study were guided by the following Research Questions (RQs):

1. What are faculty perceptions of facilitators and barriers to the implementation of the ITESM Educational Model?

2. How do individual characteristics and the extent of professional development affect present concerns of faculty regarding adoption of the ITESM Educational Model?

3. What administrative leadership interventions are perceived as facilitating the implementation of the ITESM Educational Model?

SELECTION OF RESEARCH METHODOLOGY

In considering the implementation of this study, the researcher examined alternative inquiry perspectives that might be compatible with the structure of the investigation. Due to the nature of this exploratory study, both the positivist and naturalistic approaches were considered as both are legitimate designs and useful for different situations. Patton (1990) stated that philosophers of science and methodologists have been engaged in a long-standing epistemological debate about the most effective way to conduct research.

> This debate has centered on the relative value of two fundamentally different and competing inquiry paradigms: (1) logical-positivism, which uses quantitative and experimental methods to test hypothetical-deductive generalizations, versus (2) phenomenological inquiry, using qualitative and naturalistic approaches to inductively and holistically understand human experience in context-specific settings. (Patton, 1990, p. 37)

Positivist Inquiry and Naturalistic Inquiry Paradigms

Scheurich (2000) reported that, within the positivist paradigm, a deductive research approach is based on the scientific method's rationality[11]. Positivist theories are descriptive of patterns in empirical, material reality. Thus, theories must be tested in reference to empirical reality. An empirically tested

[11] The scientific method is an inquiry research framework following a predetermined sequence: (1) Start with a question, (2) Formulate a hypothesis, (3) Devise a method to test the hypothesis (research design), (4) Prepare defensible methodology, (5) Determine instrumentation (validity and reliability), (6)Generate internal and external validity (generalizability), (7) Obtain deductive results throughout logic/mathematics, (8) Produce empirically grounded theory.

theory makes prediction and control possible. Within positivism, the nature of reality is considered to be single, tangible, and fragmentable. Inquiry is value-free, the researcher role is external to research, and the analysis is deductive. Positivism relies largely on quantitative research methodologies. It uses specifically designed instrumentation (e.g., surveys) and seeks a controlled-experimental research setting. The purpose of positivism is prediction. It cares about results (not personal experiences) and seeks to produce empirically-grounded theory.

Patton (1990) considered the research setting to be a natural occurring event, program, or community that has no predetermined course established by and for the researcher. Naturalistic inquiry uses an inductive research analysis approach, a holistic perspective, and the use of qualitative data.

> Guba (1978) defined “naturalistic inquiry” as a “discovery-oriented” approach that minimizes investigator manipulation of the study setting and places no prior constraints on what the outcomes of the research will be. Naturalistic inquiry is thus contrasted to experimental research in which, ideally, the investigator attempts to completely control conditions of the study by manipulating, changing, or holding constant external influences and in which a very limited set of outcome variables are measured. (Patton, 1990, p. 41)

After considering the positivist and naturalistic inquiry perspectives, the researcher determined that a positivist inquiry paradigm was well suited for the questions to be addressed and the constraints of time and resources. A deductive cause-effect analysis was established by the researcher to help the generalizability of the study's results. The researcher required the participation of a large and diverse number of subjects in the study. Data collection was required to be completed during a relatively short period of time (three months). Thus, the study was conducted through the inquiry lens of positivism to meet these conditions.

Quantitative and Qualitative Methods

Patton (1990) stated data-collection options and strategies for any particular applied research inquiry depend on answers to several questions.

> Qualitative methods permit the evaluator to study selected issues in depth and detail. Approaching fieldwork without being constrained by predetermined categories of analysis contributes to the depth, openness, and detail of qualitative inquiry. Quantitative methods, on the other hand, require the use of standardized measures so that the varying perspectives and experiences of people can be fit into a limited number of predetermined response categories to which numbers are assigned. (Patton, 1990, pp. 13-14)

Although the ITESM System, a multi-campus private institution of higher education in Mexico, is experiencing system-wide systemic change, this study was conducted as an exploratory study on a single campus of the institution. Focusing on faculty from one campus—the Mexico City campus—the study analyzed concerns and perceptions of facilitators, barriers, and leadership interventions as a means of acquiring an in-depth understanding of the mandated educational change process. The scope of the study included the high school and undergraduate educational levels at the Mexico City campus of the ITESM System. No graduate level programs were included in this study, because the implementation of the MET did not involve this educational level.

Using a quantitative-based approach, the researcher was able to survey a large and diverse number of faculty members and collect information about their concerns and perceptions regarding implementation of the MET. The researcher was also able to conduct data analyses for the study's research questions through different selected statistical methods to test the study hypothesis. "The advantage of a quantitative approach is that it's possible to measure the reactions of a great many people to a limited set of questions, thus facilitating comparison and statistical aggregation of the data" (Patton, 1990, p. 14). However, secondary analysis of institutional qualitative data and documents provided the researcher with essential information for refining the focus of the study and developing instrumentation.

Qualitative Data Analysis

Relevant campus-level and system-level information was used in order to provide a better understanding of the context of this study. Qualitative data previously collected by the ITESM Mexico City Center for Educational Innovation for the assessment of institutional effectiveness of educational initiatives and system-level documents developed during change intervention processes were used to better understand the context of the ITESM change process and to identify possible issues, barriers and facilitators to be examined in the present study. Such data and documents provided useful information in framing this study. “Document analysis in qualitative inquiry yields excerpts, quotations, or entire passages from organizational, clinical, or program records; memoranda and correspondence; official publications and reports; and open-ended written responses to questionnaires and surveys” (Patton, 1990, p. 10).

Specifically, qualitative data collected during the systemic educational change process prior to this study was used to construct and validate Likert-type perception instruments of facilitators, barriers and leadership interventions in the implementation of the MET. Analysis of this data showed several factors concerning facilitators, barriers, and leadership interventions that relate to different levels of adoption of the student-centered, collaborative, and technology-assisted teaching and learning practices inherent in the MET. Data from the analysis were used to develop or redesign three Likert Scale-based instruments to acquire a broader range of specific information on facilitators, barriers, and leadership interventions involved in the ITESM educational change process.

A Likert-type scale is an instrument that associates ordinal values with qualitative attributes. It is a rating scale measuring the strength of agreement towards a set of clear statements. It is often administered in the form of a questionnaire used to gauge attitudes or reactions. The most common scale is 1 to 5. Often the scale will be: 1 = strongly disagree, 2 = disagree, 3 = not sure, 4 = agree, and 5 = strongly agree (http://www.uni.edu/its/us/document/stats/spss2.html#lik).

The next section of this chapter provides a detailed description of the instrumentation used in the study.

INSTRUMENTATION

This study relied largely on quantitative methods supported by survey research. Validity in quantitative research depends on careful instrument construction to be sure that the instrument measures what it is supposed to measure. "The instrument must be administered in an appropriate, standardized manner according to prescribed procedures. The focus is on the measuring instrument—the test items, survey questions or other measurement tools" (Patton, 1990, p. 14).

Study data was collected through an online Web-based survey form containing the following multiple choice/selection instruments:

0. A General Demographic Questionnaire
1. A Stages of Concern Questionnaire (SoCQ)
2. (a) A Facilitators Perception Questionnaire
   (b) A Barriers Perception Questionnaire

3. A Leadership Interventions Questionnaire/Checklist.

A summarized description of these instruments, their origins and development is provided next.

General Demographic Questionnaire (copy in Appendix B, pp. 371-372)

This instrument was comprised of 15 multiple choice items. It was designed for this study to collect basic demographic information from participants for the purpose of classification into categories for data analysis procedures. Important information relevant to the three research questions was collected via this instrument, and included the following for each participant:

- Age and gender
- Work status group (full-time or part-time)
- Educational Level (Bachelor or Master's degree, or Doctorate)
- Academic unit (School)
- Years of teaching at the institution
- Advancement level in ITESM's professional development program.

Section I of the Web-based survey contained this instrument, and is shown in Appendix B, Questionnaire 1.

Stages of Concern Questionnaire (copy in Appendix B, pp. 373-376)

The Stages of Concern Questionnaire (SoCQ) was a multiple choice 35-item instrument used to measure faculty concerns for Research Question 2 (RQ2).

The SoCQ is part of the Concerns Based Adoption Model (CBAM) developed by Hall and Hord (1998). The CBAM is an empirically-based conceptual framework which outlines the development process that individuals experience as they implement a new educational innovation and participate in staff development.

The Stages of Concern Questionnaire (SoCQ) is a formal and precise measure of an individual participant's stages of concern. "The composite representation of the feelings, preoccupation, thought, and consideration given to a particular issue or task is called *concern*" (Hall, 2001, p. 61). The SoCQ was developed by Hall and Hord through a process that involved reviewing the relevant literature, developing lists of statements describing concerns, item writing, Q-sorting by a panel of judges, completion of a 195-item prototype, administering the prototype to 366 individuals, and factor analysis (Hall et al., 1977).

> The most rigorous technique for measuring concerns is the Stages of Concern Questionnaire (SoCQ), which is a 35-item questionnaire that has strong reliability estimates (test/retest reliabilities range from 0.65 to 0.86) and internal consistency (alpha-coefficients range from 0.64 to 0.83) (Hall, 2001, p. 68).

The 35-item SoC Questionnaire (SoCQ) "was developed through extensive research that has assured its validity and reliability" (Hall, 1998, p. 35). The Stages of Concern (SoC) 35-item questionnaire comprised Section II of the study's Web-based survey for data collection. One of the senior researchers for the SoCQ, Dr. Shirley Hord, at the Southwest Educational Development Laboratory[12] (SEDL), headquartered in Austin, Texas, granted permission for use of this instrument (see Appendix A, Form A1).

As part of the ITESM Mexico City institutional effectiveness effort, the Stages of Concern Questionnaire was translated into Spanish by this researcher with permission from the SEDL, and adapted to correspond to the ITESM Educational Model. "The SoCQ was constructed to apply to all educational innovations. The questionnaire items stay the same, with the only change being the insertion of the name of the specific innovation on the cover page" (Hall et. al, 2001, p. 68). Adapting the SoCQ to correspond to the MET consisted of replacing the words: "this innovation" (Hall, et. al, 1998, p.p. 48-49) in the SoCQ items text with the words: "the ITESM Educational Model (MET)". Appendix B, Questionnaire 2 provides this adapted instrument.

Based on Fuller's work (1969), Hall and Hord (2001) defined the concerns level concept as: (1) Self, (2) Task, and (3) Impact. These authors found that the *Self, Task* and *Impact* pattern of concerns is found in people involved with all types of innovations and change processes.

> Self-concerns tend to be most prevalent when student teachers begin their student teaching or other more intense clinical work. They have concerns about teaching, but within an egocentric frame of reference. These expressions indicate a concern about teaching,

[12] The Southwest Educational Development Laboratory (SEDL) is one of the national centers for educational research, headquartered in Austin, TX, USA.

> but with a focus on the teacher rather than on the act of teaching or the needs of the children. Task concerns show up quite soon after the start of student teaching, as the actual work of teaching becomes central. Impact concerns are the ultimate goal for student teachers, teachers, and professors. (Hall & Hord, 2001, p. 59)

Through research, Hall and Hord (2001) have identified and confirmed a set of seven specific categories of concerns about educational innovations. These categories are called Stages of Concern (SoC) and are illustrated in Table 4.

Table 4. Stages of Concern (Hall & Hord, 2001, p. 61)

	Stages of Concern	Expressions of Concern
IMPACT	6 Refocusing	I have some ideas about something that would work even better.
	5 Collaboration	I am concerned about relating what I am doing with what my co-workers are doing.
	4 Consequence	How is my use affecting clients?
TASK	3 Management	I seem to be spending all of my time getting materials ready.
SELF	2 Personal	How will using it affect me?
	1 Informational	I would like to know more about it.
	0 Awareness	I am not concerned about it.

The participants categorical concerns levels for Research Question 2 (RQ2) were determined through the CBAM Stages of Concern procedure (Hall, 2001; Hall, George & Rutherford, 1979). This step-by-step procedure has been summarized by the researcher as shown in Table 5.

Table 5. Summary of the CBAM Stages of Concern Procedure for RQ2 (Researcher's summary of the CBAM SoC procedure covered in Hall et. al [2001], pp. 61-63, 233)

Step 1	Step 2	Step 3	Step 4	Step 5
Stages of Concern Questionnaire responses from participants (35 items)	Seven Stages of Concern Scores (composite sum scores) for: 1. Awareness 2. Informational 3. Personal 4. Management 5. Consequence 6. Collaboration 7. Refocusing	Seven Relative Concern Intensity Percentiles	SoC percentile determined from highest obtained value	Concern Level determined as: • Self • Task • Impact
→	→	→	→	

CBAM STAGES OF CONCERN PROCEDURE

The participants' responses to the 35-item SoC Questionnaire provided scores for each of the CBAM Seven Stages of Concern: (1) awareness, (2) informational, (3) personal, (4) management, (5) consequence, (6) collaboration, and (7) refocusing. Each stage of concern was obtained through a previously-determined set of five questions in the SoC Questionnaire (Step 1). The Seven Stages of Concern scores (composite sum scores) were obtained for each participant (Step 2). These seven composite sum scores were then converted into seven relative concern intensity percentiles by means of the Stages of Concern (SoC) Quick Scoring Device provided by Hall and Hord (2001, pp. 233-234)

(Step 3). The highest obtained value determined the SoC percentile (Step 4). This later score determined one of the following concern levels: (a) Self, (b) Task, and (c) Impact, in accordance with the CBAM framework (Step 5).

Facilitator and Barrier Questionnaires (copies in Appendix B, pp. 377-386)

The facilitator and barrier questionnaires were two separate 5-point Likert Scale-based instruments used to measure faculty perceptions of Facilitators and Barriers for Research Question 1 (RQ1). Together, the 62-item questionnaire for Facilitators and the 71-item questionnaire for Barriers comprised the third section of the Web-based survey. (Questionnaires 3 and 4 in Appendix B provide a sample of both instruments.)

These perception scales for facilitators and barriers were constructed by a four-member Questionnaires Development Team (QDT) during 2003. The members of this team were:

1. Dr. Paul Resta, professor and director of the Learning Technology Center (LTC) at the University of Texas at Austin.

2. Dr.(c) Marylu Menchaca, research associate at the LTC, the University of Texas at Austin.

3. Dr. Mónica Porres, professor and director of the Center for Educational Innovation at the Mexico City campus of ITESM.

4. Dr.(c) Carlos Enrique González, primary researcher of this study.

Both scales were developed and tested after a comprehensive analysis of institutional secondary data, including different qualitative sources from ITESM such as Force-Field Analysis[13] and a summarized list of facilitators and barriers obtained from a previous institutional effectiveness effort. A summarized set of facilitators and barriers reported in the literature about the adoption of educational innovations provided additional background to be included in the faculty perceptions of barriers and facilitators questionnaires.

> During some ITESM professional development workshops held in Monterrey and Mexico City for faculty and academic administrators during Fall 2002, system-wide information was collected through action plans, Force-field Analysis, and survey results of faculty, campus presidents, deans and department chairs. The information was used to construct Likert scales to measure Facilitators and Barriers to the mandated change implementation and helpfulness of the Leadership Interventions. Items for the initial Facilitators Barriers and Perceptions Likert-scales were developed from different qualitative data sources. During a two-year period, data was collected from alternative qualitative sources such as: (a) Force-field analysis conducted with a cadre of approximately 100 ITESM faculty working in 3-4 member collaborative groups during the 2001 and 2002 UT-ITESM Summer Institutes held in Austin; (b) equivalent Force-field analysis conducted with 350 ITESM academic administrators (e.g. campus presidents, deans, department chairs, program chairs and other academic officials) during professional development workshops on the Fall 2002; (c) a summarized list of facilitators and barriers obtained from 134 participants from the ITESM

[13] Force-Field Analysis is a widely used method for identifying the various forces that will support or resist the proposed changes to an educational innovation. Forces that help achieve the educational change are called “driving forces”. Forces that work against the change are called “restraining forces”. By identifying the forces that may impede or support the implementation of the ITESM Educational Model (MET), change facilitators may develop strategies to reduce the impact of the opposing forces and strengthen the supporting forces (Resta, UT-ITESM Summer Institute 2002).

> Mexico City institutional effectiveness effort conducted at the beginning of the Spring 2003 semester served as pilot data for instrument development purposes. (Menchaca, Resta, González, & Porres, 2004, p. 3)

Analysis of this data permitted the construction of multiple-item perception questionnaires of facilitators and barriers related to the implementation of the ITESM Educational Model. It also surfaced several factors on facilitators and barriers that related to different levels of implementation of the student-centered, collaborative, and technology-assisted teaching and learning process at ITESM. A summarized description of the construction and validation of these instruments follows.

From Qualitative Open-Ended Questions to Quantitative Likert Scale-based Questionnaires

As indicated previously, data on different aspects of the ITESM Educational Model implementation was collected from the ITESM Mexico City institutional effectiveness initiative conducted at the beginning of the Spring 2003 semester. Five open-ended questions were included as part of a paper-based survey. Specifically, faculty participants were asked to respond to one question about facilitators, and another question about barriers.

The two open-ended questions employed for this purpose were as follows:

1. From your personal experience, what has facilitated the adoption of the ITESM Educational Model (MET)?

2. From your personal experience, what barriers have you encountered to the implementation of the ITESM Educational Model (MET)?

A total of 134 full-time and part-time faculty members from the Mexico City campus of ITESM submitted their paper-based surveys before April 30, 2003. Participation in this pilot effort was entirely voluntary. First, all responses were content-analyzed and clustered in specific categorical sets of ideas by Menchaca, Resta, González, and Porres (2004) before framing the definitive content of the facilitator and barrier questionnaires. After several face-to-face and online team-work sessions, the four members of the Questionnaires Development Team (QDT) converted the resulting concepts into simple statements that were additionally enriched with other statements from previous institutional qualitative sources of content. Specifically, the statements related to driving forces and restraining forces to the implementation of the MET previously obtained from Force-Field Analysis conducted with ITESM faculty and academic administrators in 2001 and 2002 added to enrich the statements obtained from the two open-ended questions.

During analysis of the two open-ended questions, the four-member QDT looked for patterns, by group, in the responses to each of the two questions. Due to the significant volume of text generated from the two open-ended questions, thematic codes were developed. The coding process looked at the actual words used by the participants, and the context of the discourse itself, to generate the code labels as suggested by Strauss and Corbin (1998).

Coding was done primarily on a sentence-by-sentence or paragraph-by-paragraph basis. A concerted effort was made to give each passage of written text its own discrete code. The researcher was able to consolidate the codes under the guiding conceptual categories of facilitators and barriers, from which emergent themes were generated through additional content analysis. These categories were analyzed for similarities and differences between the groups of responses collected at different points in time. In the end, these categories were key in determining the facilitator and barrier factors used to analyze RQ1. Patterns were identified and categories developed. Guba and Lincoln (1981) suggested the following guidelines for developing categories: (a) consider the number of people who mention something or the number of times something is mentioned, (b) consider the importance and credibility of the category to one's purpose and audience, (c) consider categories that stand out due to their uniqueness, and (d) consider categories that reveal an area of investigation that has not been previously recognized.

Clustering was another strategy used to derive meaning from the data. Merriam (1988) defines this as “the tactic of grouping together things that appear similar” (p. 249). Responses were organized in clusters during the earlier stage of the process. Similar clusters obtained from faculty were merged into lists by major categories, along with others derived from academic administrators’ institutional data.

Having determined two separated exhaustive lists—one for Facilitators and one for Barriers—multiple-item questionnaires for facilitator and barrier perceptions were developed next by the QDT. After several face-to-face and online team-work sessions, Menchaca, Resta, González, and Porres (2004) came up with two-separate perception scales: (1) a 62-item questionnaire for Facilitators, and (2) a 71-item questionnaire for Barriers. The final versions of both instruments were generated after a collaborative cross-review strategy by the Questionnaires Development Team. These versions were then carefully reviewed, refined, and translated into Spanish by the researcher during the summer of 2003 (see Questionnaires 3 and 4 in Appendix B).

Finally, results of the Facilitator and Barrier instruments were factor analysed[14] in order to acquire clear measurement levels from the scales constructs and Alpha reliabilities were obtained for each factor. "In search of the constructs measured by the scales, Factor Analysis was performed" (Menchaca et al., 2004, p. 3).

As indicated before, validity in quantitative research depends on careful instrument construction to be sure that the instrument measures what it is supposed to measure. The next section of this chapter provides a summarized description of the factor analysis performed for each instrument and their results.

Facilitator Factor Analysis

Menchaca, Resta, González, and Porres (2004) analyzed the 62 Facilitator-based items contained in this perception questionnaire and 6 main groupings of items (i.e., factors) were found using Maximum-likelihood as the extraction method[15]. In order to achieve a simple data structure, Factor Analysis (FA) usually requires rotation of the factors (Promax was used as the rotation method

[14] *Factor Analysis* (FA) refers to a wide variety of statistical techniques for analyzing models which explicitly provide a separation of shared and unique variance (Harris, 1975, p. 25). FA can be understood as a data reduction technique for identifying the internal structure of a set of variables. It reduces attribute space from a larger number of variables to a smaller number of factors (http://www2.chass.ncsu.edu/garson/pa765/factor.html).

[15] The *Maximum-likelihood method* generates factors in such a way as to maximize the probability that the observed pattern of correlations could have arisen through random sampling from a population in which the correlations are perfectly reproducible from the number of factors specified by the researcher (Harris, 1975, p. 26)

because it provided the best solution for the study's data. Promax uses oblique rotation that allows factors to be correlated).

As a result, the six-factor structure describing the facilitators data was correlated. Items loaded in only one factor were selected for the scale. From the initial 62 items contained in the questionnaire, 21 had a strong loading in one factor and small loading in other factors and, therefore, were selected for the scale. Items that significantly loaded in more then 1 factor were removed from this analysis. Results from this factor analysis are shown in Appendix C, Table C1.

Having completed the Facilitators Factor Analysis (FA), each facilitator factor name was determined after the 4-member QDT had analyzed all items contained in each factor, and the researcher had carefully conducted a final review for each factor name.

The names and alpha reliabilities of the six factors were: (1) Students Acceptance of Change, Alpha = 0.91; (2) Adoption/Adaptation of Courses, Alpha = 0.87; (3) Institutional Change Culture, Alpha = 0.87; (4) Ongoing Support and Training, Alpha = 0.78; (5) Faculty Academic Background, Alpha = 0.75; and (6) Professional Learning Community, Alpha = 0.81.

A summarized description of the Facilitator factors for Research Question 1 (RQ1)—What are faculty perceptions of facilitators and barriers to the implementation of the ITESM Educational Model?—is provided by the researcher in Table 6.

Table 6. Facilitator Factors for RQ1

Facilitator Factors (Name)	Facilitator Factors (Description)	Alphas (Reliabilities)
1. Students acceptance of change	ITESM students' trusted participation and acceptance in educational change and the use of technology.	0.91
2. Adoption/Adaptation of courses	Possibility for faculty of adopting and making adjustments to system-level high-quality redesigned courses.	0.87
3. Institutional change culture	ITESM philosophy and values-based culture promotes innovation, change, and entrepreneurial spirit.	0.87
4. Ongoing support and training	Support provided by pedagogical and technological advisors from ITESM Learning Technology Centers.	0.78
5. Faculty academic background	Faculty members' individual academic discipline, years of teaching experience, and pedagogical skills.	0.75
6. Professional learning community	Collegiate work in ITESM system-wide academies and local academic departments. Appropriate organizational structure of the institution.	0.81

Barrier Factor Analysis

Menchaca, Resta, González and Porres (2004) also analyzed the 71 Barrier-based items contained in this perception questionnaire, and found 8 main groupings of items (i.e., factors) using Maximum-likelihood as the extraction method. In order to achieve a proper data structure, Factor Analysis (FA) usually requires rotation of the factors. There are different methods of extracting the factors from a set of data. Oblimin[16] was used as the rotation method, because it provided the best solution for the study's data. This method uses oblique rotation, allowing factors to be correlated. As a result, the eight-factor structure describing the Barriers data was correlated. Items loaded in one factor were selected for the scale. From the initial 71 items contained in the instrument, 34 items evidenced a strong loading in one factor and small loading in other factors and, therefore, were selected for the scale. Items that significantly loaded in more than 1 factor were removed from this analysis. Results from this factor analysis are shown in Appendix C, Table C2.

Having completed the factor analysis, each barrier factor name was also determined after the four-member QDT had analyzed the items contained in each factor, and the researcher had conducted a final review for each factor name.

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[16] Direct Oblimin rotation is the standard method used when a non-orthogonal solution—that is, one in which the factors are allowed to be correlated—is desired (http://www2.chass.ncsu.edu/garson/pa765/factor.htm).

The names and alpha reliabilities of the eight factors were: (1) Monitor Implementation, Alpha = 0.90, (2); Top-down Leadership, Alpha = 0.81; (3) Students Adaptation to Change, Alpha = 0.92; (4) Infrastructure Operational Problems, Alpha = 0.81; (5) Time, Alpha = 0.88; (6) Administrative Alignment and Support, Alpha = 0.85; (7) Support Shortcomings, Alpha = 0.83; and (8) Faculty Issues, Alpha = 0.84.

A summarized description of the Barrier factors for Research Question 1 (RQ1) is provided in Table 7.

Table 7. Barrier Factors for RQ1

Barrier Factors (Name)	Barrier Factors (Description)	Alphas (Reliabilities)
1. Monitor implementation	Lack of institutional evaluation of the MET's implementation and lack of classroom monitoring to improve the MET.	0.90
2. Top-down leadership	ITESM's centralized decision making process promotes upper level decisions.	0.81
3. Students adaptation to change	Lack of students' new learning habits and adaptation to work collaboratively. Students' apathy towards ITESM new teaching-learning process.	0.92
4. Infrastructure operational problems	Proper operation of technological platforms, computational servers operational failures, and maintenance of IT infrastructure.	0.81
5. Time	Lack of time for courses' continuous improvement and interaction with students. Lack of time to become involved in the change process and for feedback during the implementation process. Time required to fully understand the MET.	0.88
6. Administrative alignment and support	Academic units and administrative areas have different objectives and lack of alignment of administrative processes with the MET. Academic administrators' understanding of the MET.	0.85
7. Support shortcomings	Support deficiencies during the implementation process. Lack of support from technological and pedagogical advisors.	0.83
8. Faculty issues	Change resistance to new educational paradigms and to new faculty roles. Faculty skepticism about the effectiveness of the MET. Required use of didactic methods in redesigned courses.	0.84

The Facilitators and Barriers perception instruments were tested and validated during the UT-ITESM Summer Institute 2003. A pilot group of approximately 50 academic administrators and faculty from different campuses of

ITESM completed these questionnaires during one of the working sessions of the summer institute. Two summarized lists with the highest scores for implementation barriers and facilitators were obtained, as shown in Table 8.

Table 8. Implementation Barriers and Facilitators with the Highest Scores (Menchaca, Resta, Gonzalez & Porres, 2004, pp. 4-5)

MET Implementation Barriers (Barriers with highest scores)	**MET Implementation Facilitators (Facilitators with highest scores)**
1. Growing demands in work load for students and faculty.	1. Faculty desire for increased learning and professional development.
2. Time needed for continuous course review and feedback.	2. External didactic techniques and professional development and support.
3. Continual changes in the MET during implementation.	3. Access to technology.
4. Faculty work load.	4. Positive attitude to change.
5. Time needed for course follow-up and online interaction with students.	5. Desire to participate in innovation.
6. Centralized decision-making process.	6. Acceptance of technology by students.
7. Top level decision-making.	7. Faculty commitment to the institution.
8. Lack of clarity in student learning evaluation criteria.	8. Institutional support for professional development.
9. Lack of time to interact with other faculty.	9. Institutional philosophy.
10. Lack of additional incentives to advance in the implementation of the MET.	10. Pedagogical design of courses.

Leadership Interventions Questionnaire/Checklist (copy in Appendix B, pp. 387-391)

The Leadership Interventions Checklist was a 6-point Likert-type instrument used to measure faculty perceptions of leadership interventions that facilitated the implementation of the ITESM Educational Model. This 60-item scale-based instrument was adapted, expanded, and translated into Spanish for higher education by the Questionnaires Development Team (QDT) from the original Change Facilitators' Actions to Support Change Checklist (Hall & Hord, 2001). The 60-item scale comprised the fourth section of the study's Web-based survey. (Questionnaire 5 in Appendix B provides a sample of this instrument).

The Change Facilitators' Actions to Support Change Checklist is a component of the CBAM model developed by Hall and Hord (1998). The original Change Facilitators' Actions to Support Change Checklist "was developed through a process that involved documenting the actions (i.e., interventions) associated with implementing curricular programs, behavior processes, and other innovations in a number of schools" (Hall & Hord, 1987, p. 74). The Change Facilitators' Actions to Support Change framework derived from the SEDL's effort to complete a broad review of the leadership and change facilitation literature, in order to identify relevant research-based concepts and information that could support the training of effective facilitative leaders for school improvement projects. "This wide-ranging review of the literature focused on the actions and behaviors of leaders who were facilitating change, in other words, on interventions" (Hall et. al, 2001, p. 108).

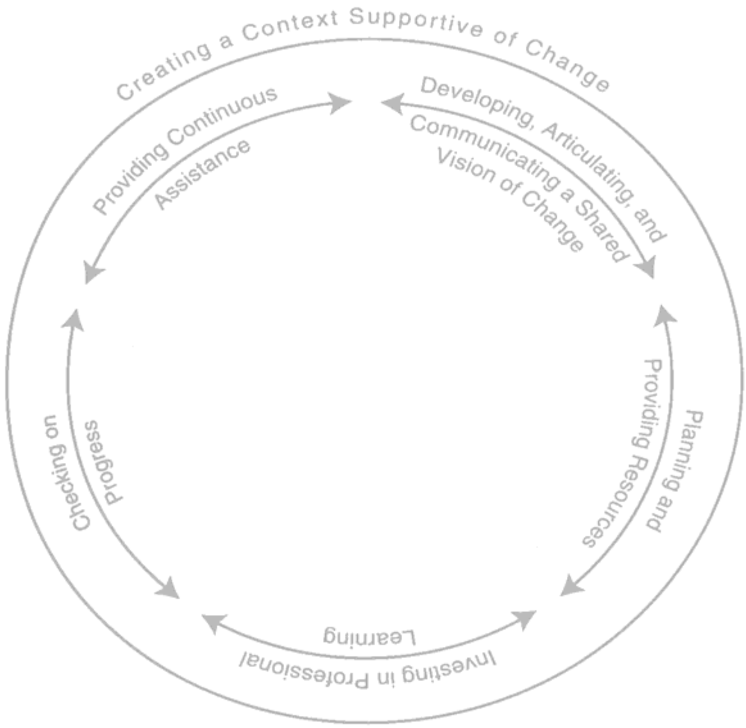
Hall and Hord identified six distinct categories of change interventions, which they designated "Game Plan Components", because they collectively comprise a total change effort (Hall & Hord, 1984). The idea of a game plan as a practical and easy-to-use framework is derived from the expectation that leaders need to provide services to support the change process, and also to be actively engaged in planning the change.

In its initial version (Hall & Hord, 1998, pp. 74-78), the Change Facilitators' Actions to Support Change Checklist organized items into six categories of change interventions: (a) developing supportive organizational arrangements, (b) training, (c) consultation and reinforcement, (d) monitoring, (e) external communication, and (f) dissemination. Hall and Hord (1984) determined these categories and considered the first four categories vital to successful educational change. The CBAM studies revealed the final two "are less frequently executed but quite important in change efforts" (Hall & Hord, 2001, p. 113).

Hall and Hord's initial work on Leadership Actions to Facilitate Change has been revised in the latest edition of their publication (Hall & Hord, 2001). This updated framework (pp. 108-113) presents a reorganized set of similar categories or functions of change interventions: (a) Developing, Articulating and

Communicating a Shared Vision of Change; (b) Planning and Providing Resources; (c) Investing in Professional Learning; (d) Checking on Progress; (e) Providing Continuous Assistance; and (f) Creating a Context Supportive of Change. “The literature review resulted in identifying these interventions, which were organized into six types or functions (Hall et al., 2001, p. 108). An illustration of these six functions of change interventions is shown in Figure 4.

Figure 4. Six functions of change interventions (Hall & Hord, 2001, p. 109)



A brief description of these categories or functions of change interventions is provided next by this researcher.

(a) Developing, Articulating, and Communicating a Shared Vision of the Intended Change. The development of a shared dream or vision is a necessary step in moving toward educational change. A clear vision that identifies changes or innovations selected for adoption and implementation is needed. The elements of the shared vision must be communicated by facilitators to enable implementers to move toward high-quality adoption of the intended change.

(b) Planning and Providing Resources. After a shared vision has been determined, planning for its realization is necessary. Planning and the provision of resources represent an important means by which implementers are enabled to initiate implementation and sustain the change. A critical resource for change is time. Change policies, rules and guidelines, staffing new roles, seeking and acquiring materials, providing space, and accessing funds are very important for the change to succeed.

(c) Investing in Professional Learning. Change means developing new understandings and doing things in new ways. Learning is the basis for change. Consequently, formal ongoing training and other forms of staff and personal development are essential to prepare implementers for educational change. Training and development are innovation-related and should focus on the vision of the change. Change leaders need to consider specific interventions related to the professional learning process.

(d) Checking on Progress. Change does not occur overnight, so the process must be continuously assessed and monitored. Too often, change efforts are lost when the leadership team fails to routinely check the progress of each implementer. Change facilitators must collect and analyze data about implementation progress.

(e) Providing Continuous Assistance. When needs or problems are identified during the change process, a response is required to support implementation. Such assistance opportunities may take different forms (e.g., providing additional materials, offering learning activities, etc.) and constitute crucial behaviors by facilitators in encouraging implementers.

(f) Creating a Context Supportive of Change. The context, climate, and/or culture of the institution critically influence—either supporting or inhibiting—change. Boyd (1992b) states that two components of the context are crucial: (a) physical (e.g., building facilities, schedules, policies, etc.) and (b) people (e.g., beliefs, values, attitudes, etc.). Change leaders can take actions to create a supportive context for educational change. (Hall et al., 2001, pp. 107-113).

"In summary, these six types of basic interventions or functions, identified from the SEDL's Leadership for Change Institute (Boyd et al., 1993), have been widely used as a framework for developing the knowledge and skills that facilitators need to plan for change, monitor its progress, and evaluate its outcomes in terms of degree of classroom implementation" (Hall et al., 2001, p. 113).

This latest set of six categories of change interventions described above was used by this researcher to develop the 60-item Leadership Interventions Questionnaire to measure RQ3.

Leadership Interventions Factor Analysis

Menchaca, Resta, González and Porres (2004) examined the 60 Leadership Intervention items contained in this perception questionnaire and found six main groupings of items (i.e., factors) using Maximum-likelihood as the extraction method. Out of 60 items, 23 had a strong loading in one factor and small loading in other factors and therefore were selected for the scale. Items that were significantly loaded in more than one factor were removed from this analysis. Results from this factor analysis are shown in Appendix C, Table C3.

As with the facilitator and barrier factors, each leadership intervention factor name was determined after the four-member QDT had analyzed all items contained in each factor, and the researcher had conducted a final review for each factor name.

The names and alpha reliabilities of the six Leadership Intervention factors were: (1) Ongoing Support/Coaching, Alpha = 0.88; (2) Continuous Communication, Alpha =0.87; (3) Monitoring Progress, Alpha = 0.89; (4) Supportive Change Culture, Alpha = 0.89; (5) Providing Resources and Supportive Organizational Arrangements, Alpha = 0.81; and (6) Investing Time and Resources in Professional Development, Alpha = 0.78.

A summarized description of the Leadership Intervention factors for Research Question 3 (RQ3)—What administrative leadership interventions are perceived as facilitating the implementation of the ITESM Educational Model?—is provided by the researcher in Table 9.

Table 9. Leadership Intervention Factors for RQ3

Leadership Intervention Factors (Name)	Leadership Intervention Factors (Description)	Alphas
1. Supportive Change Culture	ITESM culture of collaboration and educational innovation.	0.89
2. Time and Resources for Professional Development	Time devoted to work on the acceptance of new faculty roles and new technologies. Allocation of economic resources to reward professional development.	0.78
3. Monitoring Progress	Data collection and analyses to assess the effects of the ITESM Educational Model.	0.89
4. Ongoing Support/Coaching	Academic administrators encouraged faculty to constantly improve the MET implementation through a positive educational environment.	0.88
5. Providing Resources and Arrangements	Information Technology infrastructure and related support are in place.	0.81
6. Continuous Communication	Academic administrators communicated with individual faculty and with small and large groups of faculty.	0.87

The Leadership Interventions instrument was also tested and validated during the UT-ITESM Summer Institute 2003 by a pilot group of approximately 50 academic administrators and faculty from different campuses of ITESM who completed the questionnaire during one of the working sessions of the summer institute.

As indicated earlier, study data was collected through a Web-based survey form which contained multiple selection instruments. Specifically, facilitator, barrier, and leadership intervention questionnaires described in this section were developed, tested and validated by Menchaca, Resta, González, and Porres (2004)—the four-member Questionnaires Development Team (QDT)—for the purpose of this study. Work on the instruments is continuing to obtain reliabilities higher than 0.8 for the factors *Ongoing Support and Training, Faculty Academic Background, and Investing Time and Resources for Professional Development*. Table 10 provides a summary of these instruments, factors and alphas.

Table 10. Study Instruments, Factors and Alphas

Instrument	Factors	Alphas
The Facilitators Questionnaire (62 items)	1) Students Acceptance of Change	0.91
	2) Adoption/Adaptation of Courses	0.87
	3) Institutional Change Culture	0.87
	4) Ongoing Support and Training	0.78
	5) Faculty Academic Background	0.75
	6) Professional Learning Community	0.81
The Barriers Questionnaire (71 items)	1) Monitor Implementation	0.90
	2) Top-Down Leadership	0.81
	3) Students Adaptation to Change	0.92
	4) Infrastructure Operational Problems	0.81
	5) Time	0.88
	6) Administrative Alignment and Support	0.85
	7) Support Shortcomings	0.83
	8) Faculty issues	0.84
The Leadership Interventions Questionnaire/Checklist (60 items)	1) Ongoing Support /Coaching	0.88
	2) Continuous Communication	0.87
	3) Monitoring Progress,	0.89
	4) Supportive Change Culture	0.89
	5) Providing Resources and Arrangements	0.81
	6) Time and Resources for Professional Development	0.78

QUANTITATIVE WEB-BASED SURVEY RESEARCH

Survey research is based on the well-established practice of exploring issues by asking people questions (Tourangeau, Rips, & Rasinkiski, 2000). Survey research is one of the most widely-used methods of research in the social sciences. “Surveys may be used for descriptive, explanatory, and exploratory purposes” (Babbie, 1979, p. 315). Over the last 25 years, the way in which surveys are presented to respondents has undergone a fundamental transformation. Researchers have begun to accommodate and take advantage of technological advances that affect all aspects of survey administration, including societal contexts. “There are two main methods of administering a questionnaire to a sample of respondents: self-administered or administered by staff interviewers” (Babbie, p. 331).

The face of survey research has changed drastically as computers have supplanted pencils and clipboards as the survey interviewer’s most indispensable tools. Using the computer to collect data has had a variety of effects. “The different methods of collecting survey data—self-administered questionnaires, interviews conducted by telephone or face-to-face, computer-assisted telephone and personal interviews, automated self-administered questionnaires—differ along many dimensions” (Tourangeau et al., 2000, p. 20). “The accuracy of surveys depends on the accuracy of respondent answers, and researchers have found considerable evidence that the method of data collection affects the answers obtained" (Tourangeau et al., p. 312).

Depending on a variety of factors, the change from paper-based to computer-based data collection may increase or decrease survey bias and errors, or leave them unchanged. While the principles of survey research have remained largely unchanged, general trends during the last half century have undoubtedly contributed to the emergence of computer-based survey collection methods. Couper and Nichols (1998) describe the development of computer-assisted survey research methods, including the fundamental principles of survey methods:

First, a population of interest is defined to which the survey results will be generalized (e.g., people or organizations). Second, a sampling frame (e.g., list) of the population members is constructed. Third, probability methods are used to select a sample from the frame of the appropriate size to reach reliable conclusions about the population. Fourth, a carefully designed and pre-tested questionnaire (instrument) is prepared containing the questions to be asked of the sampled respondents. Fifth, largely successful efforts are made to complete all relevant items of the questionnaire with each sampled respondent under relatively comparable conditions. Sixth, the questionnaire data are captured in a standardized format and edited for consistency and completeness. And seventh, the results are analyzed and interpreted using the tools and principles of statistical theory to infer conclusions about the defined population. (Couper & Nichols, p. 3)

Many of the principles of survey research are not fully met under real-life conditions of research, or are relaxed to meet cost, time, or other constraints. Couper and Nichols (1998) noted that precise population definitions, exhaustive sampling frames, full probability sampling, thoroughly pre-tested questionnaires, and fully-successful field operations are not always attainable. In actual practice, researchers often encounter a variety of difficulties applying these principles in the field. As a result, coverage errors, sampling errors, non-response errors, measurement errors, and time constraints contribute to the possible errors and limitations associated with the research mode.

Since the mid-1980s, electronic questionnaires have been used in most areas of data collection. "*Computerized self-administered questionnaire* is the general term we use to identify all computerized questionnaires that request information electronically from respondents without an interviewer present and where respondents use their own (or their organization's) personal computer (PC) to respond" (Ramos, Sedivi, & Sweet, 1998, p. 389).

Self-administered questionnaires generally obtain higher levels of reporting of sensitive behaviors than do face-to-face interviews (Bradburn, 1983). Sudman and Bradburn (1974) suggested that personal interviews are more affected by self-presentation concerns than self-administered questionnaires, and that this difference is likely to have an especially large effect on reports about sensitive behaviors. Regardless of the response format of the items, respondents are likely to attempt the task of reporting their answer in the most convenient manner possible.

> Respondents will use ranges or round values to report numeric quantities, make ratings that follow a few simple principles, select an answer from a set of options, or adopt answer strategies that entirely bypass serious consideration of the question, to the extent that they are tired, uninterested, or generally unable to cope with the demands of the burden that the questions will impose (Tourangeau et al., 2000, p. 254).

"Respondents doubtless want to cooperate by providing accurate information, but they are not immune to other considerations—such as the desire to avoid embarrassment" (Tourangeau et al., 2000, p. 433).

MIXED-METHODS RESEARCH RELIABILITY

Although this exploratory study relied largely on quantitative methods, the use of qualitative institutional data analysis provided additional information to help enrich and support a deeper level of understanding of results from the surveys. As Greene, Caracelli, and Graham (1989) noted,

> The core premise of triangulation as a design strategy is that all methods have inherent biases and limitations….When two or more methods that have offsetting biases are used to assess a given phenomenon, and the results of these methods converge or

> corroborate one another, then the validity of inquiry findings is enhanced. (p. 256)

Triangulation, defined by Denzin (in Lincoln & Guba, 1985), is “the use of multiple and different sources” (p. 305). Lincoln and Guba suggested that reliability, which traditionally has to do with the extent to which one's research can be replicated, is better understood in qualitative research as dependability or consistency of results. In discussing external validity and generalizability, Merriam (1988) argued, “one selects a particular case because one wishes to understand the particular in depth” (p. 173).

Triangulation has been accomplished in this study by the use of multiple sources of data: Web-based questionnaires, and qualitative analysis of institutional documents and data. In addition, member checking and peer debriefing were employed within the QDT to allow critical feedback during the construction and translation of the Likert-type instruments. The Facilitator and Barrier instruments, the Stages of Concern Questionnaire (SoCQ), the Leadership Change Interventions Questionnaire/Checklist, and selected institutional documents and data served to “get to the finding in the first place—by seeing or hearing multiple instances of it from different sources” (Miles & Huberman, 1994, p. 267).

In summary, this research comprised a mixed-methods exploratory study largely based on quantitative-research supported by Web-based surveys. The inquiry perspective was mostly based on a logic-positivist philosophy in order to fulfill the study's objectives.

POPULATION OF INTEREST AND SAMPLE SIZE

The sample for the study was drawn from faculty at the Mexico City campus of ITESM. The faculty at this campus is composed of both part-time and full-time professors. For the Fall 2003 semester, the total faculty population on campus comprised 978 individuals. The overall distribution of faculty per academic division (School) and work status group (full-time and part-time) is shown in Table 11.

Table 11. Distribution of ITESM Mexico City Campus Faculty per School (Fall 2003 Semester)

Academic Division (School)	# of Faculty Members	% of Faculty per School	Full-time	% of Full-time	Part-time	% of Part-time
High School	264	27%	127	48%	137	52%
Engineering	282	29%	111	39%	171	61%
Business	217	22%	108	50%	109	50%
Liberal Arts	215	22%	76	35%	139	65%
Total	978	100%	422	43%	556	57%

There were 264 faculty members (27%) from the High School; 282 (29%) from the School of Engineering and Architecture; 217 (22%) from the School of Business Administration; and 215 (22%) from the School of Humanities and Social Sciences (Liberal Arts).

To gain a significant and representative sample of the faculty population, the researcher determined to achieve the participation of at least 250 subjects (approximately 25% of the total population).

Participants

The human subjects in this exploratory research study were drawn from the population of ITESM's Mexico City campus faculty who voluntarily responded to invitation letters for participation (Forms A2 and A3 in Appendix A provide copies of these letters). As indicated, the study's design sought to achieve the voluntary participation of at least 250 faculty members (25% of the total)—full-time and part-time—with teaching responsibilities at the high school and undergraduate educational levels (see Table 11, p. 142). In order to achieve a representative sample, faculty members from all academic units (the High School, the School of Engineering and Architecture, the School of Business Administration, and the School of Social Sciences and Humanities [Liberal Arts]) were invited to participate following the requirements and research protocol of the University of Texas at Austin's Institutional Review Board (IRB).

DATA COLLECTION

Study data was collected through an online Web-based survey administered to the participants. Faculty members participating in the study were invited to complete a multiple selection online survey form with four different sections, as shown in Table 12. A description of the instruments contained in this survey was provided in the previous section of this chapter.

Table 12. Online Web-based Four-Section Survey

Survey Sections	**Questionnaires**
Section 1	A 15-item General Demographic Questionnaire
Section 2	A 35-item Stages of Concern Questionnaire (SoCQ)
Section 3	A 62-item Facilitators Questionnaire and a 71-item Barriers Questionnaire
Section 4	60-item Leadership Interventions Questionnaire/Checklist

This Web-based survey was designed to provide anonymity to participant responses, in accordance with the University of Texas at Austin's Institutional Review Board (IRB) standards on research with human subjects. A dedicated password-protected Web site was developed for the purpose of data collection. The Web site was housed on a server at the University of Texas at Austin's College of Education's Learning Technology Center. All faculty members from the Mexico City campus—a cadre of approximately 980 individuals—were invited to participate in the online Web-based survey on a voluntary basis.

The survey was designed so that respondents were able to complete all sections of the electronic survey in approximately one hour. Participants were asked to respond to the survey during working hours or at their own convenience through Internet-connected personal computers. Use of their own laptops (provided by the ITESM Mexico City campus) or use of PCs available at different faculty lounges at the ITESM Mexico City campus was encouraged. Participants gained access to the survey through a private Internet-accessible server located at the University of Texas at Austin's College of Education's Learning Technology Center. The online surveys were submitted to the University of Texas website at the following URL address:

http://student.edb.utexas.edu/itesm/2003/ccm2003.html.

The participants' identities were held confidential by automatically assigning an ID number for each online survey completed. No name was required for completing the survey. Data was coded so that no information remained that could personally identify the subjects. The data was stored securely in the University of Texas at Austin's College of Education. Data was collectively analyzed at the School level (division level), and not at the academic department or individual level. Data from the surveys were examined exclusively for research purposes by the primary researcher, his dissertation committee and their research associates.

The Process of Data Collection

Once the Institutional Review Board's (IRB) office at the University of Texas, Austin granted permission to conduct the proposed research with human subjects, the study's data collection process started in early August, 2003. A predefined plan of action was established in order to achieve the participation of at least 250 individuals (approximately 25%) from the 978 potential subjects.

The study's data collection design employed an 8-10 week period for the 250 participants to complete and submit their electronic surveys. Starting on August 8, 2003, data was collected during three predetermined stages separated by 2-4 day intervals. Each stage was guided by a specific strategy to stimulate faculty interest in participating. There were, however, both major and minor adjustments to these data collection stages that led to the final participation of 333 respondents.

Formal data collection was preceded by a focus on critical issues such as the study's IRB protocol submission and approval; technical refinement of the Web-based survey and its related database configuration; preparation of the participants' invitation packages (containing the primary researcher's invitation letter, an invitation letter from the researcher's committee co-chairs, and the participation consent form. See Appendix A for further reference on these documents); logistical arrangements, and set-up of the data collection's final strategy.

A summarized description of each of the data collection stages follows.

Stage I: Start-Up Invitation

The primary goal of Stage I was to launch a large-scale invitation effort to all potential research participants. This stage was scheduled to cover the three-week period from August 8-31, 2003. On August 8, 2003—two days before the beginning of the ITESM Fall 2003 semester—all full-time faculty members at the ITESM Mexico City campus were invited to participate in the study. The invitation was made verbally during the regular Fall Full-Time Faculty Assembly. Almost 330 printed invitation packages were personally handed out to all faculty members present. Additionally, an email was sent on August 11, 2003 to all full-time professors, inviting them once again to participate in the study. On August 9, 2003, the same type of formal invitation was made to approximately 580 part-time faculty members during the regular Fall Kick-Off Assembly; written invitations were subsequently delivered. A total of 910 faculty members were reached during both sessions. These regularly-scheduled faculty meetings became a unique opportunity to formally launch the study's data collection effort.

By August 30, 2003, a total of 18 surveys had been submitted to the University of Texas website. This initial low response can be explained by several factors. First, the faculty's attention was focused on their academic duties during the first days of the semester. Consequently, responding to the web-based survey was not their main priority. Second, technical problems due to world-wide virus worm attacks affected many Information Technology (IT) networks, including the ITESM and UT Austin websites. The Web-based survey also evidenced certain design flaws, creating unexpected problems. For example, some participants did not complete all sections of the online survey, because the questionnaires' databases were separate from each other. Separating the questionnaire databases was intended to provide flexibility to participants wishing to fill out alternate sections of the survey at different times. A personal ID code was required to tie all sections of the survey to each single individual participating in the survey. The sequential six-digit ID code necessary to gain access to all sections of the survey was not included at the beginning of the data collection process. This proved to be a painful survey design flaw. In addition, the welcome and online survey instructions screens were not posted adequately during the first week, and many potential participants lost their printed invitation letters and could not remember the URL address and password required to access the survey. These critical problems were solved before the initiation of Stage II.

Stage II: Participation Reinforcement

The primary goal for this stage was to substantially increase the number of participants. From September 1-22, 2003, a series of actions was taken, increasing the number of submitted surveys to 139. The most effective actions were:

- The primary researcher sent an email to full-time and part-time faculty to remind potential participants of the online survey's URL address and password.

- An email was sent by the ITESM Mexico City Learning Technology Center staff to MET facilitators, deans, and department chairs, re-requesting voluntary participation, and providing a reminder of the survey's URL and password.

- Several paper flyers containing the online survey's URL address and password were distributed among all secretaries of academic department chairs; flyers were also distributed at different faculty lounges across campus.

- The ongoing progress of data collection by School was shared with faculty by email. As the numbers of submitted surveys varied from School to School, a sense of positive competitiveness emerged among each School's faculty.

Following the implementation of these measures, there was a significant increase in the number of responses to 139. However, participation was still below the desired sample of 250 subjects. Interestingly, some respondents remarked that the ITESM 60th Anniversary activities and the first partial exams—both taking place during early September—were highly time-consuming and that they had therefore not been able to complete the survey earlier.

Stage III: Close-Up Breakthrough

In order to reach the established goal for number of participants, a renewed plan of action was put into effect during the four-week period that followed. From September 23 to October 15, 2003, the final stage for data collection was implemented. This stage employed new, alternative measures such as:

- A new email containing three main points was sent by the primary researcher to all faculty members: (a) gratefully thanking all participants who had already filled out the survey, (b) asking for assistance in obtaining additional participation in the study, and (c) sharing the updated numbers of participants per School.

- The primary researcher asked for assistance in reminding faculty of their voluntary participation in the study during the regular mid-term meeting with ITESM Mexico City deans and academic department chairs on September 25, 2003.

- A final invitation to participate in the study was issued during the regular intermediate meeting with part-time faculty on September 27, 2003. During this session, the primary researcher shared his data collection progress with a group of approximately 300 part-time faculty members. An updated report on submitted surveys per School was provided.

- The primary researcher shared the updated progress report for participation in the study during a regular meeting with ITESM Mexico City secretaries and assistants on October 7, 2003. This group of 55 support staff was asked to assist in inviting interested faculty members to voluntarily participate in the research. Once again, the survey's URL and password were highlighted, as some of the support staff mentioned that many faculty—most of them part-time—were not aware of the study or their potential to participate.

These measures resulted in the submission of 85 additional surveys. A total of 224 participants had completed the survey by October 16, 2003, 91% of the desired sample goal. This outcome seemed to reasonably fit the study's data requirements for statistical analysis. However, a large number of faculty members and academic administrators mentioned that the institution's calendar for second partial exams—from October 6-15, 2003—had occupied much of their time, and did not submit the online survey before the deadline. At this point, an unscheduled Fourth Stage for data collection was implemented through October 31, 2003.

Stage IV: Extended Period

This extended two-week period for data collection was not initially contemplated. The online survey's URL address was kept accessible until the end of October 2003. The primary researcher sent a final email to all faculty members, academic administrators, and secretaries announcing the decision to extend the data collection period for two extra weeks. Additional thanks were expressed for voluntary participation in the research project, and the last available progress report on faculty's participation was attached. The final report containing all surveys submitted by the ITESM Mexico City campus faculty was issued on November 8, 2003. A total of 333 participants had submitted their online surveys, more than 100 of them during the extended two-week period.

Table 13 provides a summary of the study's ongoing data collection process.

Table 13. Summary of Ongoing Data Collection from Participants at ITESM's Mexico City Campus

Stages	Range of Dates (2003)	Main Actions	Cumulative # of respondents
I: Start-Up Invitation	August 8-30	Large-scale formal invitation to potential participants.	18
II: Participation Reinforcement	September 1-22	Printed and electronic communications to remind potential participants of the survey's URL address and password, and to share data collection progress.	139
III: Close-Up Breakthrough	September 24 - October 15	Face-to-face and electronic invitations to potential participants and other key players.	224
IV: Extended Period	October 16-31	Web-based survey was kept accessible. Final electronic communication to thank participants.	333

The total number of respondents, 333, represented 34% of the total faculty population at the ITESM Mexico City campus. 245 (73.5%) out of the respondents submitted the four sections of the online survey. The other 88 lacked one or more sections of the survey. Table 14 provides the final count of faculty participation per Academic Unit/School.

Table 14. Final Count of Faculty Participation per Academic Unit/School

	Academic Unit					Total # of respondents
	Unknown	Liberal Arts	Engineering	Business	High School	
Complete Data	3	63	64	62	53	245
Incomplete Data	6	23	22	24	13	88
Total Surveys Submitted	9	86	86	86	66	333

DATA ANALYSES

This study was guided by three research questions pertaining to faculty concerns and perceptions of facilitators, barriers, and leadership interventions in implementing the mandated systemic educational change at the ITESM Mexico City campus. These research questions were assessed through statistical analyses including factor analysis (FA), multinomial logistic regression, and multivariate analysis of variance (MANOVA). Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS, 2003) and a probability (p) value of 0.05 or less was employed for significance testing. Due to the exploratory nature of the study, probability values between 0.05 and 0.1 were employed for marginally significant results.

Research Question 1 (RQ1)

What are faculty **perceptions of facilitators and barriers** to the implementation of the ITESM Educational Model (MET)?

Hypothesis 1 and Data Analyses

Hypothesis 1 can be divided into two sub-hypotheses:

Hypothesis 1a. It was hypothesized that faculty at different levels of adoption will have significantly different **perceptions of the facilitators** to the implementation of the ITESM Educational Model when individual characteristics are taken into consideration.

Hypothesis 1b. It was hypothesized that faculty at different levels of adoption will have significantly different **perceptions of the barriers** to the implementation of the ITESM Educational Model when individual characteristics are taken into consideration.

This research question was measured using two separate 5-point Likert Scale-based instruments consisting of: (1) a 62-item questionnaire for facilitators, and (2) a 71-item questionnaire for barriers as previously described.

Hypothesis 1 was tested using two separate MANOVA (multivariate analysis of variance) analyses: Hypothesis 1a for Facilitators, and Hypothesis 1b for Barriers. These analyses were conducted through a two (Work Status Group) by five (Professional Development/MET Implementation Level) by four (Academic Unit) by four (Years of Teaching at ITESM) by two (Educational Level) by two (Gender) MANOVAs with six Facilitator factors scores for 1a, and eight Barrier factors scores for 1b as dependent variables (DVs).

MANOVA was used to examine the main interaction effects of categorical variables on multiple dependent interval variables. MANOVA uses one or more categorical independent variables as predictors. In this case, it was used to compare groups formed by categorically independent variables to group differences in a set of interval dependent variables (Garson, 2003).

Dependent Variables. The dependent variables (DVs) for Hypothesis 1a were the six Facilitator factor scores described earlier. The facilitator factors had been obtained through factor analysis. Factor Analysis (FA) refers to a wide variety of statistical techniques for analyzing models which explicitly provide a separation of shared and unique variance. FA provided the grouping of critical items (i.e., factors) in the facilitator questionnaire into the following six factors: (1) Students Acceptance of Change, (2) Adoption/Adaptation of Courses, (3) Institutional Change Culture, (4) Ongoing Support and Training, (5) Faculty

Academic Background, and (6) Professional Learning Community. Table 6 (see p. 102) provides a summarized description of the Facilitator factors for RQ1.

Independent Variables (IVs). *Work-Status Group*, the first predictor or independent variable (IV) in the MANOVA analyses for Hypothesis 1a was a fixed variable, represented by the 2 levels of work group: (1) Full-time, and (2) Part-time. The second IV was *Professional Development/MET Implementation Level* defined by five categorical levels: (1) Non-user, (2) Inexperienced user, (3) Experienced user, (4) Experienced-Advanced user, (5) Renewing user. The third IV in the analysis—*Academic Unit*—was a fixed variable represented by the following educational fields: (1) School of Humanities and Social Sciences (i.e., Liberal Arts); (2) School of Engineering and Architecture; (3) School of Business Administration; and (4) High School. The fourth predictor was *Educational Level*, a fixed IV determined by two categories of education: (1) Bachelor or Master's Degree, and (2) Doctorate. The fifth variable was *Years of Teaching at ITESM*, which was defined by four levels: (1) Two Years or Less, (2) Between 3 and 5 Years, (3) Between 6 and 9 Years, and (4) 10 years or More. The sixth IV was *Gender*: (1) Male, and (b) Female.

MANOVA was used to identify the main interaction effects of the categorical variables on the six Facilitator score variables mentioned above. The analysis procedure for Hypothesis 1a was repeated with eight Barrier factors scores to test Hypothesis 1b. The barrier factors were also obtained through factor analysis. This statistical tool provided the grouping of the critical items into the following eight factors: (1) Monitor Implementation, (2) Top-Down Leadership, (3) Students Adaptation to Change, (4) Infrastructure Operational Problems, (5) Time, (6) Administrative Alignment and Support, (7) Support Shortcomings, and (8) Faculty Issues. Table 7 (see p. 127) provides a summarized description of the barriers factors for RQ1.

A summarized framework of the statistical analysis for RQ1 is provided by the researcher in Table 15.

Table 15. Summarized Framework of Statistical Analysis for RQ1

Statistical Analysis for RQ1: Multivariate Analysis of Variance (MANOVA)

1a) **Facilitator Factors (DVs)**

1. Students Acceptance of Change
2. Adoption/Adaptation of Courses
3. Institutional Change Culture
4. Ongoing Support and Training
5. Faculty Academic Background
6. Professional Learning Community

1b) **Barrier Factors (DVs)**

1. Monitor Implementation
2. Top-Down Leadership
3. Students Adaptation to Change
4. Infrastructure Operational Problems
5. Time
6. Administrative Alignment & Support
7. Support Shortcomings
8. Faculty Issues

Predictors (IVs)

1.Professional Development/MET Implementation Level

- Non-User
- Inexperienced User
- Experienced User
- Experienced-Advanced User
- Renewing User

Demographics

2.Work Status Group (Part-Time or Full-Time)
3.Academic Unit (High School, Engineering, Business, or Liberal Arts)
4.Educational Level (Bachelor or Master's degree, or Doctorate)
5.Years of Teaching at ITESM (0-2, 3-5, 6-9, and 10 years or more)
6.Gender (Male or Female)

Research Question 2 (RQ2)

How do individual characteristics and the extent of professional development affect present **concerns** of **faculty** regarding adoption of the ITESM Educational Model (MET)?

Hypothesis 2 and Data Analyses

It was hypothesized that the present concerns of faculty at different stages of implementation of the MET could be predicted from individual differences such as work status, academic unit, years of teaching at the institution, educational level, gender, and MET implementation level.

This research question was measured using a 7-point Likert Scale-based instrument for Stages of Concern (SoC) from the CBAM. As explained before, the 35-item SoC Questionnaire (SoCQ) "was developed through extensive research that has assured its validity and reliability" (Hall, 1998, p. 35).

Faculty concerns regarding the adoption of the MET were examined according to the faculty's work status group, MET implementation level, and demographic variables such as gender, academic unit, years of teaching at the institution, and educational level. This research question was analyzed using multinomial logistic regression. In the analysis, the Concerns Level (DV) was predicted as: (a) Self, (b) Task, or (c) Impact. Predictors or independent variables (IVs) in the regression included *Work status group*: (1) Full-time and (2) Part-time; *MET implementation level*: (1) Non-user, (2) Inexperienced User, (c) Experienced User, (d) Experienced-Advanced User, and (e) Renewing User; demographic factors including number of *Years of teaching at ITESM*: (1) Two Years or Less, (2) Between 3 and 5 Years, (3) Between 6 and 9 Years, and (4) 10 years or More; *Educational level*: (1) Bachelor or Master's Degree, and (2) Doctorate; *Academic unit*: (1) High School, (2) School of Engineering and Architecture, (3) School of Business Administration, and (4) School of Humanities and Social Sciences (Liberal Arts); and *Gender*: (1) Male, and (2) Female.

A multinomial logistic regression was conducted to test Hypothesis 2. The variables under scrutiny are complicated, and required data analysis techniques that describe the data's complexities. The statistical analysis allowed the data to reveal relationships of interest to systemic change in higher education. Multinomial logistic regression is a form of regression used when the dependent variable is a variable with more than two categories, and the independent variables are continuous variables, categorical variables, or both. Multinomial logistic regression is used for dependent variables with a greater number of classes. Logistic regression applies maximum likelihood estimation after transforming the dependent into a logistic variable (the natural logistic of the odds of the dependent variable occurring or not). Thus, logistic regression estimates the probability of a certain event occurring (Garson, 2003).

Logistic regression does not assume a linear relationship between the dependent and the independent variables, does not require normally distributed variables, does not assume homocedasticity for each level of the independent variable(s), and does not assume normally distributed error terms (Garson 2003), making the procedure useful for testing Hypothesis 2.

Implementation of the MET was defined by five categorical levels: (a) Non-user, (b) Inexperienced User, (c) Experienced User, (d) Experienced-Advanced User, and (e) Renewing User. The fifth stage of implementation was used as the reference group in the logistic regression.

A summarized framework of the statistical analysis for RQ2 is provided by the researcher in Table 16.

Table 16. Summarized Framework of Statistical Analysis for RQ2

Statistical Analysis for RQ2: Multinomial Logistic Regression

- **Concerns Level (DVs)**
  1. Self
  2. Task
  3. Impact

- **Predictors (IVs)**
  1. Professional Development/ MET Implementation Level
     - Non-User
     - Inexperienced User
     - Experienced User
     - Experienced-Advanced User
     - Renewing User

  Demographics
  2. Work Status Group (Part-Time or Full-Time Faculty)
  3. Academic Unit (School)
  4. Educational Level (Bachelor or Master's Degree, or Doctorate)
  5. Years of teaching at ITESM (0-2, 3-5, 6-9, or 10 or more)
  6. Gender (Male or Female)

Research Question 3 (RQ3)

What administrative **leadership interventions** are perceived as facilitating the implementation of the ITESM Educational Model (MET)?

Hypothesis 3 and Data Analyses

It was hypothesized that faculty will have significantly different perceptions of the administrative **leadership interventions** facilitating the implementation of the ITESM Educational Model when individual characteristics are taken into consideration.

This research question was measured using a 60-item Likert Scale-based instrument. As described previously, this questionnaire was adapted and expanded for use in a higher education context from Hall and Hord's *Change Facilitators' Actions to Support Change Checklist* (2001), and translated into Spanish for the purpose of this study.

Hypothesis 3 was tested using a two (Work Status Group) by five (Professional Development/MET Implementation Level) by two (Gender) by four (Academic Unit) by four (Years of Teaching at ITESM) by two (Educational Level) MANOVA (multivariate analysis of variance) with six leadership interventions as dependent variables (DVs).

MANOVA was used to identify the main interaction effects of categorical variables on multiple dependent interval variables. MANOVA uses one or more categorical independent variables as predictors. In this study, it was used to compare groups formed by categorically independent variables to group differences in a set of interval dependent variables (Garson, 2003).

The facilitating leadership interventions of interest in Hypothesis 3 were assessed through a MANOVA analysis. Six composite scores were calculated from the averaged responses to the 6 facilitating administrative leadership intervention types, which became the 6 dependent variables.

Work Status Group, the first predictor or independent variable (IV) in the MANOVA analyses, was a fixed variable represented by the two levels of work status: (1) Full-time, and (2) Part-time. The second IV was *Professional Development/MET Implementation Level*, defined by five categorical levels: (1) Non-user, (2) Inexperienced User, (3) Experienced User, (4) Experienced-Advanced User, and (5) Renewing User. The third IV in the analysis was a fixed variable represented by two levels of *Gender*: (1) Male, and (2) Female. *Academic Unit* was the fourth predictor in the MANOVA analysis, and was determined by the following academic units: (1) High School, (2) School of Engineering, (3) School of Business Administration, and (4) School of Humanities and Social Sciences (Liberal Arts). *Years of teaching at ITESM* was another fixed IV in the analysis, and was defined by four levels of the faculty's number of years at the institution: (1) Two Years or Less, (2) Between 3 and 5 Years, (3) Between 6 and 9 Years, and (4) 10 Years or More. The last predictor of the MANOVA analysis was the faculty's *Educational Level*, defined by two categories of education: (1) Bachelor or Master's degree, and (2) Doctorate.

MANOVA was used to examine the main interaction effects of the categorical variables on six facilitating leadership intervention variables. The facilitating leadership intervention types were represented by a random variable defined by composite scores of six categories of mandated change interventions: (a) Supportive Change Culture, (b) Time and Resources for Professional Development, (c) Monitoring Progress, (d) Ongoing Support/Coaching, (e) Providing Resources and Arrangements, and (f) Continuous Communication. Table 9 (see p. 135) provides a summarized description of the Leadership Interventions factors for RQ3.

A summarized framework of the statistical analysis for RQ3 is provided by the researcher in Table 17.

Table 17. Summarized Framework of Statistical Analysis for RQ3

Statistical Analysis for RQ3: Multivariate Analysis of Variance (MANOVA)

Leadership Interventions (DVs)

1. Time and Resources for Professional Development
2. Monitoring Progress
3. Ongoing Coaching
4. Providing Resources and Arrangements
5. Supportive Change Culture
6. Continuous Communication

Predictors (IVs)

1. Professional Development/ MET Implementation Level
    - Non-User
    - Inexperienced User
    - Experienced User
    - Experienced-Advanced User
    - Renewing User

Demographics

2. Work Status Group (Part-Time or Full-Time)
3. Academic Unit (High School, Engineering, Business, or Liberal Arts)
4. Educational Level (Bachelor or Master's degree, or Doctorate)
5. Years of Teaching at ITESM (0-2, 3-5, 6-9, and 10 years or more)
6. Gender (Male or Female)

SUMMARY

This study was exploratory in nature and focused on faculty concerns and perceptions of systemic educational change. The main purpose of the study was to analyze and examine faculty concerns and perceptions of facilitators, barriers and leadership interventions in implementing the ITESM Educational Model (MET). The study was conducted at one component institution of the ITESM system—the Mexico City campus—and included the participation of full-time and part-time faculty with teaching responsibilities at the high school and undergraduate educational levels. The study was guided by three research questions. This research relied largely on quantitative-based methods in addition to comprehensive secondary analyses of institutional qualitative data and system-level documents. The research questions were assessed through statistical analysis including multinomial logistic regression and multivariate analysis of variance (MANOVA), with the support of the Statistical Package for the Social Sciences (SPSS).

The study's data was collected from a sample of 333 subjects—full-time and part-time faculty—who responded to a Web-based survey form containing several multiple-selection item questionnaires housed in a server at the University of Texas at Austin's College of Education. The questionnaires contained sections on: (I) Individual Characteristics (Demographics), (II) Stages of Concern, (III) Faculty Perception of Facilitators and Barriers, and (IV) a Facilitating Leadership Interventions Checklist. Participation in the study was strictly voluntary.

Chapter 4: Data Analysis

INTRODUCTION

The purpose of this study was to analyze faculty concerns and perceptions of facilitators, barriers and leadership interventions in implementing a mandated systemic educational change to the teaching-learning process—the ITESM Educational Model (MET)—at the Mexico City campus of the Monterrey Institute of Technology and Higher Education (ITESM), headquartered in Monterrey, Mexico. This chapter provides the study's obtained results. The chapter is organized into four sections. The first section provides a summarized description of the study's sample. The three research questions guiding the study and their related data analyses are then detailed. Lastly, a brief summary of findings is provided.

SAMPLE DEMOGRAPHICS

As indicated in the previous chapter, the sample for the study was drawn from faculty at the Mexico City campus of ITESM. The faculty at this campus is composed of both full-time and part-time professors. The total faculty population at the Mexico City campus of ITESM for the Fall 2003 semester comprised 978 individuals. The overall distribution of faculty per academic unit/division (School) and work status group (full-time and part-time) is shown in Table 11 (Chapter 3).

There were 264 professors (27%) from the High School; 282 (29%) from the School of Engineering and Architecture; 217 (22%) from the School of Business Administration; and 215 (22%) from the School of Humanities and Social Sciences (Liberal Arts).

Study data was collected through an online survey administered to participants during the Fall 2003 semester. Full-time and part-time faculty members voluntarily completed a multiple selection/choice Web-based survey form containing several questionnaires as shown in Table 12 (Chapter 3). Basic individual information was collected from participants via a 15-item general demographic questionnaire for the purpose of classification into categories for data analysis procedures. From the total of 978 faculty members (full-time and part-time), 333 subjects participated in the study, representing 34% of the total faculty population. 224 full-time professors, representing 68.3% of the total sample, participated in this study, as shown in Table 18.

Table 18. Participation by Work Status Group

		Frequency	Percent	Valid Percent[17]	Cumulative Percent
Valid	Part-time	104	31.2	31.7	31.7
	Full-time	224	67.3	68.3	100.0
	Total	328	98.5	100.0	
Missing	System	5	1.5		
Total		333	100.0		

86 professors from each of the three undergraduate schools (academic divisions) on campus responded to the survey. Each undergraduate school—Liberal Arts, Engineering, and Business—represented 26.5% of the total group of participants in the study. The High School represented 20.4% of the total group of participants. A total of 9 respondents did not provide information about their division affiliation. These results are shown in Table 19.

[17] Valid Percent figures in this column do not consider frequency-based cases with missing data. Figures only consider those cases of participants completing the demographic questionnaire. The same consideration has been made in Tables 18-23.

Table 19. Participation by Academic Unit/Division (School)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Liberal Arts	86	25.8	26.5	26.5
	Engineering	86	25.8	26.5	53.1
	Business	86	25.8	26.5	79.6
	High-School	66	19.8	20.4	100.0
	Total	324	97.3	100.0	
Missing	System	9	2.7		
Total		333	100.0		

From the total number of faculty members participating in the study, 187 (57.9%) reported their gender as male, 136 (42.1%) as female, and ten (3%) respondents did not provide gender information, as shown in Table 20.

Table 20. Participation by Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	187	56.2	57.9	57.9
	Female	136	40.8	42.1	100.0
	Total	323	97.0	100.0	
Missing	System	10	3.0		
Total		333	100.0		

Table 21 illustrates that 166 professors (50.9%) have 5 years or less of teaching experience at ITESM, and 87 professors (26.7%) have taught at the institution for 10 or more years.

Table 21. Participation by Years of Teaching at ITESM

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0-2	74	22.2	22.7	22.7
	3-5	92	27.6	28.2	50.9
	6-9	73	21.9	22.4	73.3
	10 or more	87	26.1	26.7	100.0
	Total	326	97.9	100.0	
Missing	System	7	2.1		
Total		333	100.0		

The educational level of participating faculty was represented by 186 (56.7%) individuals with a master's degree (MA-MS), 101 (30.8%) with a doctoral degree, and 41 (12.5%) with a bachelor's degree (BA-BS), as shown in Table 22.

Table 22. Participation by Educational Level

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	BA-BS	41	12.3	12.5	12.5
	MA-MS	186	55.9	56.7	69.2
	Doctorate	101	30.3	30.8	100.0
	Total	328	98.5	100.0	
Missing	System	5	1.5		
Total		333	100.0		

Professional development/MET implementation level for the study's population sample of 333 participants was classified into five categories:

1. 12.7% of faculty were non-users,
2. 14.7% were inexperienced users,
3. 21.4% were experienced users,
4. 31.4% were experienced-advanced users, and
5. 19.7% were renewing users.

A total of 217 individuals (72.5%) indicated that they were experienced, experienced-advanced, or renewing users in implementing the ITESM Educational Model; missing data was found in 34 cases. These results are summarized in Table 23.

Table 23. Participation by Professional Development/MET Implementation Level

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Non-User	38	11.4	12.7	12.7
	Inexperienced	44	13.2	14.7	27.4
	Experienced	64	19.2	21.4	48.8
	Experienced-Advanced	94	28.2	31.4	80.3
	Renewing User	59	17.7	19.7	100.0
	Total	299	89.8	100.0	
Missing	System	34	10.2		
Total		333	100.0		

STUDY OBJECTIVES AND RESEARCH QUESTIONS

In addressing the purpose of this study, the researcher specifically sought to pursue the following objectives: a) acquire a deeper level of understanding of faculty perceptions of facilitators and barriers in implementing a systemic educational change mandated by the administration; b) identify and analyze faculty levels of concern regarding adoption of the mandated systemic educational change in the teaching-learning process across different stages of implementation; c) examine faculty perceptions of change management and leadership interventions that facilitate the implementation of the mandated changes to the teaching-learning environment. The term "mandated systemic educational change" refers in the study to the implementation of a student-centered, technology-assisted teaching-learning process at the ITESM; an educational paradigm commonly referred to as the ITESM Educational Model (MET).

As indicated in the previous chapter, the study was guided by the following Research Questions (RQs):

1. RQ1: What are faculty perceptions of facilitators and barriers to the implementation of the ITESM Educational Model?

2. RQ2: How do individual characteristics and the extent of professional development affect present concerns of faculty regarding adoption of the ITESM Educational Model?

3. RQ3: What administrative leadership interventions are perceived as facilitating the implementation of the ITESM Educational Model?

These research questions were assessed using statistical analysis techniques including multinomial logistic regression, and multivariate analysis of variance (MANOVA). Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS, 2003) and a probability (p) value of 0.05 or less was employed for significant results. Due to the exploratory nature of the study, probability values between 0.05 and 0.1 were also employed for marginally/moderately significant results.

The following sections provide information on the data analysis and obtained results.

Data Analysis and Results

Data analysis and obtained results for the research questions are provided in the next three sections. In helping the reader to better understand the analysis, the researcher uses the following sequence in presenting each section: (1) Research Question, (2) Hypothesis, (3) Data Considered, (4) Type of Analysis, and (5) Results and Findings.

Research Question 1 (RQ1)

What are faculty perceptions of facilitators and barriers to the implementation of the ITESM Educational Model?

Hypothesis 1

Hypothesis 1 can be divided into two sub-hypotheses:

Hypothesis 1a. It was hypothesized that faculty at different levels of adoption will have significantly different perceptions of the **facilitators** to the implementation of the MET when individual characteristics are taken into consideration.

Hypothesis 1b. It was hypothesized that faculty at different levels of adoption will have significantly different perceptions of the **barriers** to the implementation of the MET when individual characteristics are taken into consideration.

Data Considered

In order to test this hypothesis, perception data was collected from participants via a 62-item scale instrument for facilitators, and a 71-item scale instrument for barriers, as indicated in the previous chapter. Basic individual information—work-status, professional development/MET implementation level, academic unit/school, educational level, years of teaching at ITESM, and gender—was collected from participants via a 15-item general demographic questionnaire for the purpose of classification into categories for data analysis procedures.

Multivariate Analyses

Hypothesis 1 was tested using two separate multivariate analysis of variance (MANOVA) analyses: Hypothesis 1a for Facilitators, and Hypothesis 1b for Barriers. MANOVA was appropriate because it enabled the researcher to compare groups formed by categorically independent variables to group differences in a set of interval dependent variables (Garson, 2003).

HYPOTHESIS 1A: FACILITATOR ANALYSIS

Hypothesis 1a examined whether faculty at different levels of implementation had significantly different perceptions of Facilitators to the implementation of the MET when their individual characteristics were taken into consideration.

Analysis for Hypothesis 1a was conducted through a two (Work Status Group) by five (Professional Development/MET Implementation Level) by four (Academic Unit) by four (Years of Teaching at ITESM) by two (Educational Level) by two (Gender) MANOVA with six Facilitator factor scores as dependent variables (DVs).

This MANOVA analysis was performed to examine the main effects and the interaction effects of categorical variables as predictors (i.e., independent variables) on multiple interval dependent variables. In Hypothesis 1a, MANOVA was used to compare groups formed by six categorical independent variables (IVs) to group differences in a set of six interval facilitator dependent variables (DVs).

Specifically, the six categorical independent variables in the MANOVA for Hypothesis 1a were the following: (1) Work Status Group, (2) Professional Development/MET Implementation Level, (3) Academic Unit, (4) Years of Teaching at ITESM, (5) Educational Level, and (6) Gender.

The dependent variables for Hypothesis 1a were the following six Facilitator factors: (1) Students Acceptance of Change, (2) Adoption/Adaptation of Courses, (3) Institutional Change Culture, (4) Ongoing Support and Training, (5) Faculty Academic Background, and (6) Professional Learning Community.

A more detailed description of the dependent variables (DVs) and independent variables (IVs) for Hypothesis 1a is provided in Chapter 3.

Table 24 provides a summary of the Facilitator Analysis for Hypothesis 1a (RQ1).

Table 24. Summary of Facilitator Analysis for Hypothesis 1a (RQ1)

RQ1: What are faculty perceptions of facilitators to the implementation of the ITESM Educational Model (MET)?

Hypothesis 1a. It was hypothesized that faculty at different levels of adoption will have significantly different perceptions of the facilitators to the implementation of the ITESM Educational Model when individual characteristics are taken into consideration.

Statistical Analysis for Hypothesis 1a: Multivariate Analysis of Variance (MANOVA)

1a) **Facilitator Factors (DVs)**

1. Students Acceptance of Change
2. Adoption/Adaptation of Courses
3. Institutional Change Culture
4. Ongoing Support and Training
5. Faculty Academic Background
6. Professional Learning Community

Predictors (IVs)

7. Professional Development/MET Implementation Level

- Non-User
- Inexperienced User
- Experienced User
- Experienced-Advanced User
- Renewing User

Demographics

2. Work Status Group (Part-Time or Full-Time)
3. Academic Unit (Engineering, Business, Liberal Arts, or High School)
4. Educational Level (Bachelor or Master's degree, or Doctorate)
5. Years of Teaching at ITESM (0-2, 3-5, 6-9, or 10 years or more)
6. Gender (Male or Female)

FACILITATOR DATA ANALYSIS AND OBTAINED RESULTS

A MANOVA (with a Bonferroni-test adjusted α based on the number of dependent variables) was conducted in order to determine how faculty perceptions of Facilitators varied across the five implementation levels of the MET, when the following individual characteristics were taken into consideration: (1) Work Status Group, (2) Professional Development/MET Implementation Level, (3) Academic Unit, (4) Years of Teaching at ITESM, (5) Educational Level, and (6) Gender.

Facilitator Factors Mean Responses

SPSS descriptive statistics provided the participants' perception mean responses and standard deviations for the six dependent Facilitator factors. Table 25 provides the faculty perception[18] mean responses for each dependent Facilitator factor, ranked from the highest to the lowest values. Perception mean responses within the 4-5 range are high values, whereas perception mean responses within the 1-2 range are low values. Faculty perception mean responses within the 3 range are moderate. As shown in Table 25, faculty perception mean responses were the following for each dependent Facilitator factor: (1) Students Acceptance of Change: 3.4056, (2) Adoption/Adaptation of Courses: 3.2808, (3)

[18] Faculty perceptions for these Facilitator factors were collected using a Likert-type scale instrument containing 62 close-ended questions with a five point scale ranging from:(1) None, (2) A little bit, (3) Some, (4) A lot, and (5) Very Much.

Institutional Change Culture: 3.8295, (4) Ongoing Support and Training: 3.2464, (5) Faculty Academic Background: 3.5175, and (6) Professional Learning Community: 3.0298 (see Appendix D, Table D1: *Facilitator Descriptive Statistics*).

Table 25. Faculty Perception Mean Responses for Facilitator Factors

Facilitator Factors (Name)	Facilitator Factors (Description)	Perceptions (Mean Response)
1. Institutional Change Culture	ITESM philosophy and values-based culture promotes innovation, change, and entrepreneurial spirit.	3.8295
2. Faculty Academic Background	Faculty members' individual academic discipline, years of teaching experience, and pedagogical skills.	3.5175
3. Students Acceptance of Change	ITESM students' trusted participation in and acceptance of educational change and the use of technology.	3.4056
4. Adoption/Adaptation of Courses	Possibility for faculty to adopt and make adjustments to system-level high-quality redesigned courses.	3.2808
5. Ongoing Support and Training	Support provided by pedagogical and technological advisors from ITESM Learning Technology Centers.	3.2464
6. Professional Learning Community	Collegiate work in ITESM system-wide academies and local academic departments. Appropriate organizational structure of the institution.	3.0298

These results revealed the relative importance of the Facilitator factors as perceived by the faculty. Professors at the Mexico City campus of ITESM perceived the Institutional Change Culture—the ITESM philosophy and values-based culture promoting innovation, change, and entrepreneurial spirit—as the highest-valued Facilitator factor (mean value = 3.82) to the implementation of the MET, and the Professional Learning Community—collegiate work in ITESM system-wide academies and local academic departments, supported by appropriate organizational structure of the institution—as the lowest-valued Facilitator factor (mean value = 3.02) to the implementation of the MET.

Faculty Perceptions of Facilitators

The MANOVA analysis for Hypothesis 1a was performed to examine the main effects and the interaction effects of categorical variables as predictors (i.e., independent variables) on multiple interval dependent variables. SPSS multivariate tests provided significant results and marginally significant results of faculty perceptions relating to Facilitator factors when individual characteristics were taken into consideration. Statistically significant results and marginally significant results were obtained from faculty individual characteristics' main effects and interaction effects relating to six Facilitator factors. Although marginally significant results are not as important as significant ones, they are provided due to the exploratory nature of the study.

Significant results surfaced the following **major findings**:

1. Faculty at the Mexico City campus of ITESM had significantly different perceptions of Facilitators when their work status (full-time vs. part-time) and educational level (bachelor or master's degree vs. doctorate) were taken into consideration relative to the following Facilitator factors: (a) Faculty Academic Background, (b) Institutional Change Culture, and (c) Students Acceptance of Change (see Appendix D, Table D2: *Facilitator Multivariate Tests*).

2. Faculty at the Mexico City campus of ITESM had significantly different perceptions of Facilitators when their professional development/MET implementation level (non-user, inexperienced user, experienced user, experienced-advanced user, or renewing user) was taken into consideration relative to the following Facilitator factors: (a) Ongoing Support and Training, (b) Institutional Change Culture, (c) Adoption/Adaptation of Courses, and (d) Faculty Academic Background.

Marginally significant results surfaced the following **findings**:

3. Faculty at the Mexico City campus of ITESM had marginally significant different perceptions of Facilitators when their work status (full-time vs. part-time) and professional development/MET implementation level (non-user, inexperienced user, experienced user, experienced-advanced user, or renewing user) were taken into consideration relative to the following Facilitator factors: (a) Ongoing Support and Training, (b) Institutional Change Culture, and (c) Students' Acceptance of Change (see Appendix D, Table D2: *Facilitator Multivariate Tests*).

4. Faculty at the Mexico City campus of ITESM had marginally significant different perceptions of Facilitators when their years

of teaching at the institution (0-2, 3-5, 6-9, or 10 or more years) and educational level (bachelor or master's degree vs. doctorate) were taken into consideration relative to the following Facilitator factors: (a) Students' Acceptance of Change, (b) Professional Learning Community, (c) Adoption/Adaptation of Courses, and (d) Ongoing Support and Training.

5. Faculty at the Mexico City campus of ITESM had marginally significant different perceptions of Facilitators when their academic unit (engineering, business, liberal arts, or high-school) and years of teaching at ITESM (0-2, 3-5, 6-9, or 10 or more years) were taken into consideration relative to the following Facilitator factors: (a) Professional Learning Community, and (b) Students' Acceptance of Change (see Appendix D, Table D2: *Facilitator Multivariate Tests*).

Detailed analyses of significant results and marginally significant results are provided next.

Analysis of Significant Results

Detailed analysis of significant results related to the two **major findings** are addressed next.

Significance of Professional Development/MET Implementation Level

SPSS multivariate tests provided significant results of faculty perceptions relating to Facilitator factors when Professional Development/MET Implementation Level was taken into consideration. Specifically, for faculty at different levels of adoption of the MET, there was a significant main effect

(Wilk's Lambda = 0.738, F = 1.882, df = 24, 497, p = 0.007) between their levels of Professional Development/MET Implementation Level (non-user, inexperienced user, experienced user, experienced-advanced user, or renewing user) relative to the perception of the following Facilitator factors: (a) Ongoing Support & Training, (b) Institutional Change Culture, (c) Adoption/Adaptation of Courses, and (d) Faculty Academic Background.

As shown in Table 26, the relationship between faculty levels of professional development/MET implementation was important due to significant differences between the groups in the following Facilitator factors: (a) ongoing support & training (F = 3.206, df = 4, p = 0.015), (b) institutional change culture (F = 2.833, df = 4, p = 0.027); and due to marginally significant differences in the following Facilitator factors: (c) adoption/adaptation of courses (F = 2.404, df = 4, p = 0.052), and (d) faculty academic background (F = 2.390, df = 4, p = 0.053).

Table 26. Facilitator Tests of Between-Subjects Effects: Professional Development/MET Implementation

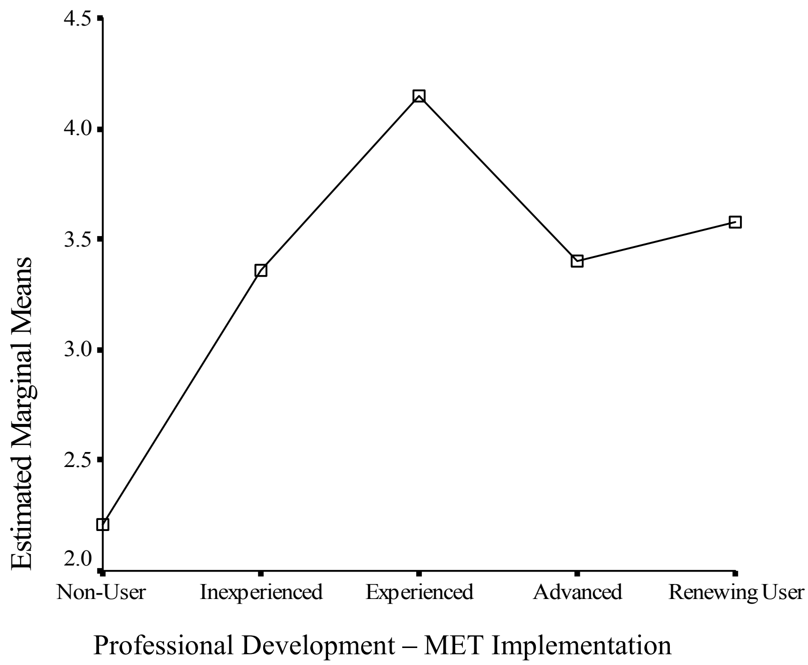
Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Observed Power (a)
Professional Development/ MET Imp.	Students Acceptance of Change	3.528	4	0.882	0.908	0.461	0.283
	Adoption/ Adaptation of Courses	12.493	4	3.123	2.404	**0.052**	0.681
	Institutional Change Culture	10.847	4	2.712	2.833	**0.027**	0.761
	Ongoing Support and Training	10.060	4	2.515	3.206	**0.015**	0.818
	Faculty Academic Background	8.683	4	2.171	2.390	**0.053**	0.678
	Professional Learning Community	3.907	4	0.977	1.169	0.327	0.360

The relationship between the different levels of faculty's professional development/MET implementation for each one of the Facilitator factors indicated above will be examined next.

Ongoing Support and Training

Differences between the obtained results of non-user (M = 2.211 ± 0.441), inexperienced user (M = 3.355 ± 0.246), experienced user (M = 4.146 ± 0.312), experienced-advanced user (M = 3.404 ± 0.570) and renewing user (M = 3.581 ± 0.387) professors are shown in Figure 5. These results illustrate the perception of faculty regarding the facilitation effect of *Ongoing Support and Training*. Results surfaced that the increase in the importance of the facilitation effect of *Ongoing Support and Training*—support provided by pedagogical and technological advisors from ITESM Learning Technology Centers—was associated with the advancement of the professional development/MET implementation process. It reached its peak value at the third level (experienced user) where professors have already completed the first two stages of implementation of the MET and the need for support and training starts to decrease.

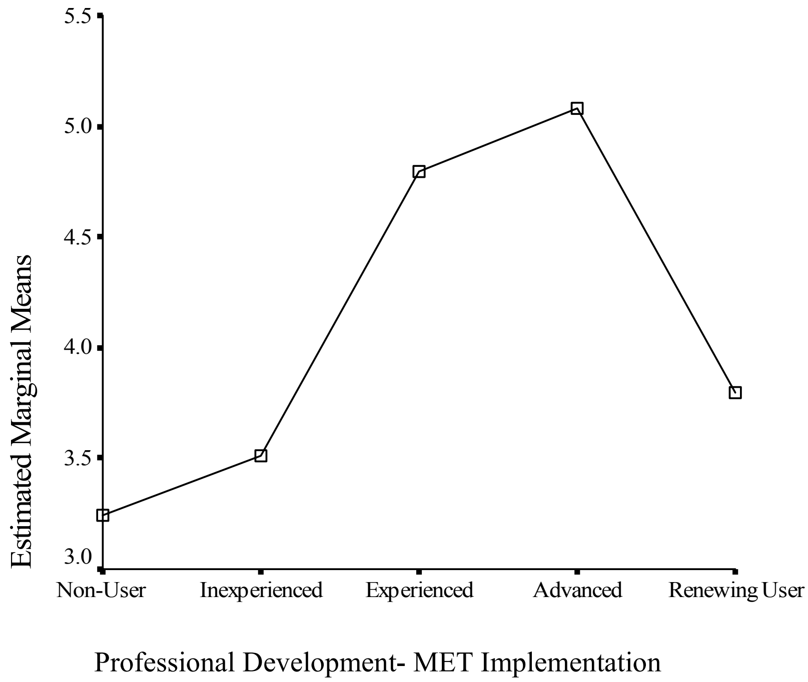
Figure 5. Estimated marginal means of ongoing support & training



Institutional Change Culture

Differences between the results of non-user (M = 3.247 ± 0.487), inexperienced user (M = 3.513 ± 0.271), experienced user (M = 4.792 ± 0.344), experienced-advanced user (M = 5.079 ± 0.630), and renewing user (M = 3.795 ± 0.428) professors are shown in Figure 6. These results illustrate the perception of faculty regarding the facilitation effect of the *Institutional Change Culture*. Results indicated that the increase in the importance of the facilitation effect of *Institutional Change Culture*—ITESM philosophy and values-based culture promoting innovation, change, and entrepreneurial spirit—was associated with the advancement of the professional development/MET implementation process. It reached its peak value at the fourth level (advanced user). The importance of this facilitator factor decreased at the renewing stage of implementation where professors help as certified-mentors for other colleagues.

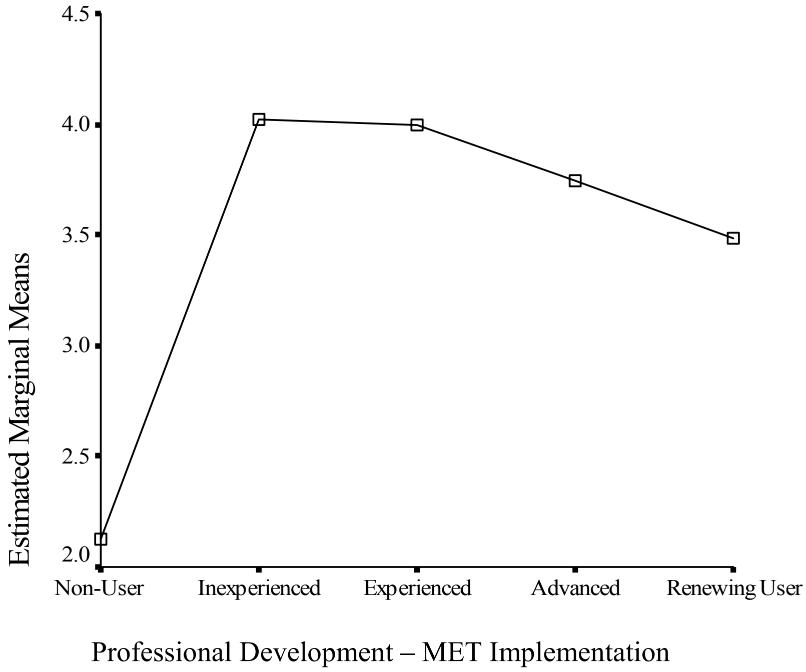
Figure 6. Estimated marginal means of institutional change culture



Adoption/Adaptation of Courses

Differences between the obtained results of non-user (M = 2.125 ± 0.568), inexperienced user (M = 4.018 ± 0.316), experienced user (M = 3.994 ± 0.401), experienced-advanced user (M = 3.745 ± 0.734), and renewing user (M = 3.481 ± 0.498) professors are shown in Figure 7. These results illustrate the perception of faculty regarding the facilitation effect of *Adoption/Adaptation of Courses.* Results showed that having access to *Adoption/Adaptation of Courses*—the possibility for faculty to adopt and make adjustments to system-level high-quality redesigned courses—was perceived as a higher facilitator in implementing the MET by inexperienced and experienced users. The importance of this facilitator factor decreased within the advanced and renewing stages of implementation where professors tend to rely on their own high-quality redesigned courses already certified at the system-level.

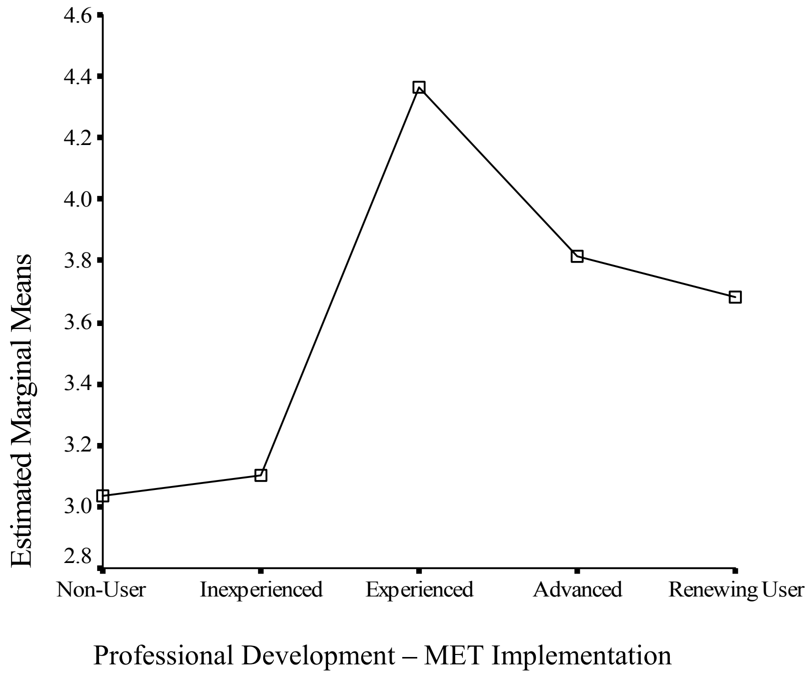
Figure 7. Estimated marginal means of adoption/adaptation of courses



Faculty Academic Background

Differences between the obtained results of non-user (M = 3.038 ± 0.475), inexperienced user (M = 3.103 ± 0.264), experienced user (M = 4.362 ± 0.335), experienced-advanced user (M = 3.812 ± 0.614), and renewing user (M = 3.685 ± 0.417) professors are shown in Figure 8.

Figure 8. Estimated marginal means of faculty academic background



These results illustrate the perception of faculty regarding the facilitation effect of *Faculty Academic Background.* Experienced level professors perceived *Faculty Academic Background*—faculty's individual academic discipline, years of teaching experience, and pedagogical skills—as a higher facilitator in implementing the MET. The importance of this facilitator factor decreased within the advanced and renewing stages of implementation but was still higher than for non-users and inexperienced users.

Significance of Faculty Work Status by Educational Level

For faculty at different levels of Professional Development/MET Implementation (non-user, inexperienced user, experienced user, experienced-advanced user, or renewing user), there was a significant interaction effect (Wilk's Lambda = 0.880, F = 3.226, df = 6, 142, p = 0.005) between their work status (full-time vs. part-time) and educational level (professors with a bachelor or a master's degree vs. professors with a doctorate) relative to the perception of the following Facilitator factors: (a) Faculty Academic Background, (b) Institutional Change Culture, and (c) Students Acceptance of Change.

As shown in Table 27, the relationship between faculty work status and educational level was important due to significant differences between the groups in the following Facilitator factors: (a) students acceptance of change (F = 4.710, df = 1, 142, p = 0.032), (b) institutional change culture (F = 9.123, df = 1, 142, p = 0.003), and (c) faculty academic background (F = 13.254, df = 1, 142, p > 0.000).

Table 27. Facilitator Tests of Between-Subjects Effects: Work Status by Educational Level

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Work Status * Educational Level	**Students Acceptance of Change**	4.573	1	4.573	0.908	**0.032**
	Adoption/Adaptation of Courses	3.126	1	3.126	2.404	0.123
	Institutional Change Culture	8.732	1	8.732	2.833	**0.003**
	Ongoing Support and Training	0.755	1	0.755	3.206	0.328
	Faculty Academic Background	12.036	1	12.036	2.390	**0.000**
	Professional Learning Community	0.457	1	0.457	1.169	0.461

SPSS Post Hoc[19] tests were conducted for the Students Acceptance of Change, Institutional Change Culture, and Faculty Academic Background Facilitator factors to examine how the estimated mean values for work status by educational level groups varied. These tests provided more detailed results that facilitated deeper levels of analysis, and are addressed next.

[19] Post Hoc refers to statistical tests conducted after finding significant differences in the means of the dependent variables for the different groups.

Students Acceptance of Change

Pairwise Comparison Post Hoc tests were conducted for the Facilitator factor *Students Acceptance of Change* to examine how the estimated mean values for work status by educational level groups varied. The results shown in Table 28 indicated that there was a significant difference between the mean values of part-time faculty with a doctorate (M = 4.368 ± .478) and full-time faculty with a doctorate (M = 3.086 ± .348). **Note**: M (Mean values) are reported ± SE (Standard error).

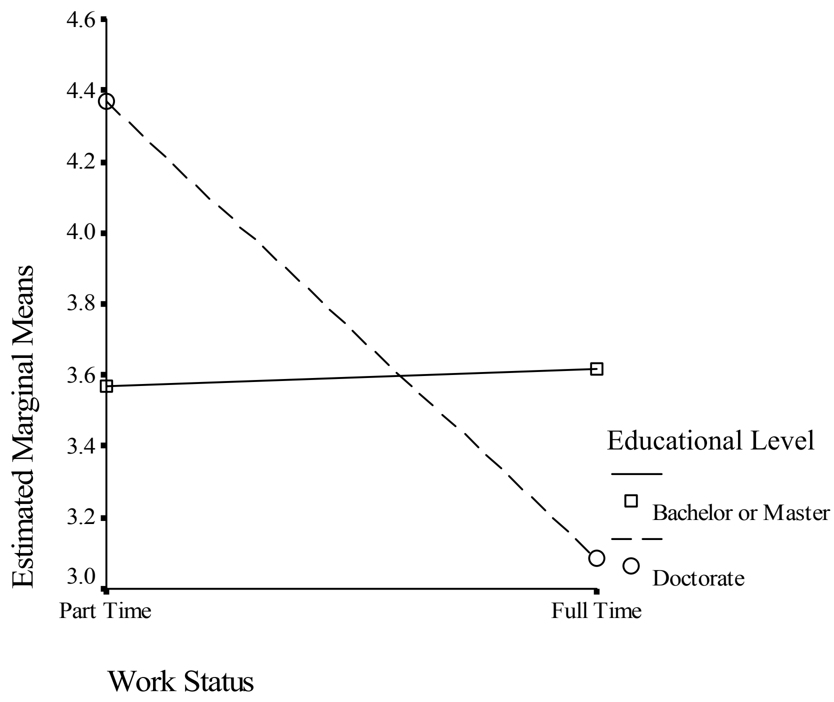
Table 28. Students Acceptance of Change Pairwise Comparisons

Dependent Variable	Educational Level	(I) Work Status	(J) Work Status	Mean Difference	Std. Error	Sig. (a)
Students Acceptance of Change	Bachelor or Master	Part-time	Full-time	-0.047	0.371	0.900
	Doctorate	**Part-time**	**Full-time**	**1.282 ***	0.535	**0.018**

Based on estimated marginal means.
* The mean difference is significant at the 0.05 level.

The difference between the mean values of part-time faculty with a doctorate and full-time faculty with a doctorate is shown in Figure 9. Such a difference surfaced that part-time professors with a doctorate had higher perception of *Students Acceptance of Change* as a facilitator in implementing the MET than full-time professors with a doctorate. In other words, ITESM students' trusted participation in and acceptance of educational change and the use of technology was perceived as a higher facilitator in implementing the MET by part-time professors with a doctorate than by full-time professors with a doctorate.

Figure 9. Estimated marginal means of students acceptance of change



Faculty Academic Background

Pairwise Comparison Post Hoc tests were conducted for the Facilitator factor *Faculty Academic Background* to examine how the estimated mean values for work status by educational level groups varied. The results shown in Table 29 indicated that there was a significant difference between the mean values of part-time faculty with a doctorate (M = 4.735 ± 0.462) and full-time faculty with a doctorate (M = 2.913 ± 0.336).

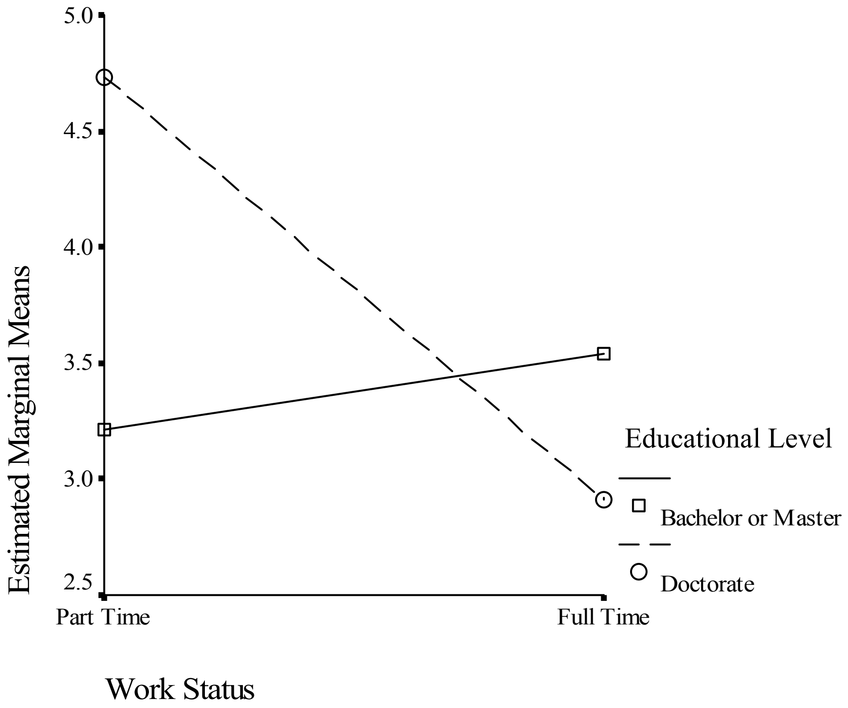
Table 29. Faculty Academic Background Pairwise Comparisons

Dependent Variable	Educational Level	(I) Work Status	(J) Work Status	Mean Difference	Std. Error	Sig. (a)
Faculty Academic Background	Bachelor or Master	Part-time	Full-time	-0.334	0.358	0.353
	Doctorate	**Part-time**	**Full-time**	**1.822 ***	**0.518**	**0.001**

Based on estimated marginal means.
* The mean difference is significant at the 0.05 level.

Figure 10 illustrates the difference between the mean values of part-time faculty with a doctorate and full-time faculty with a doctorate. Interestingly, part-time professors with a doctorate had a higher perception of *Faculty Academic Background* as a facilitator in implementing the MET than full-time professors with a doctorate. In other words, faculty academic background—individual academic field, years of teaching experience, and pedagogical skills—was perceived as a greater facilitator to implement the MET by part-time professors with a doctorate than by full-time professors with a doctorate.

Figure 10.   Estimated marginal means of faculty academic background



Institutional Change Culture

Pairwise Comparison Post Hoc tests were conducted for the Facilitator factor *Institutional Change Culture* to examine how the estimated mean values for work status by educational level groups varied. The results shown in Table 30 indicated that there was a significant difference between the mean values of part-time faculty with a doctorate (M = 5.125 ± 0.475) and full-time faculty with a doctorate (M = 3.303 ± 0.345).

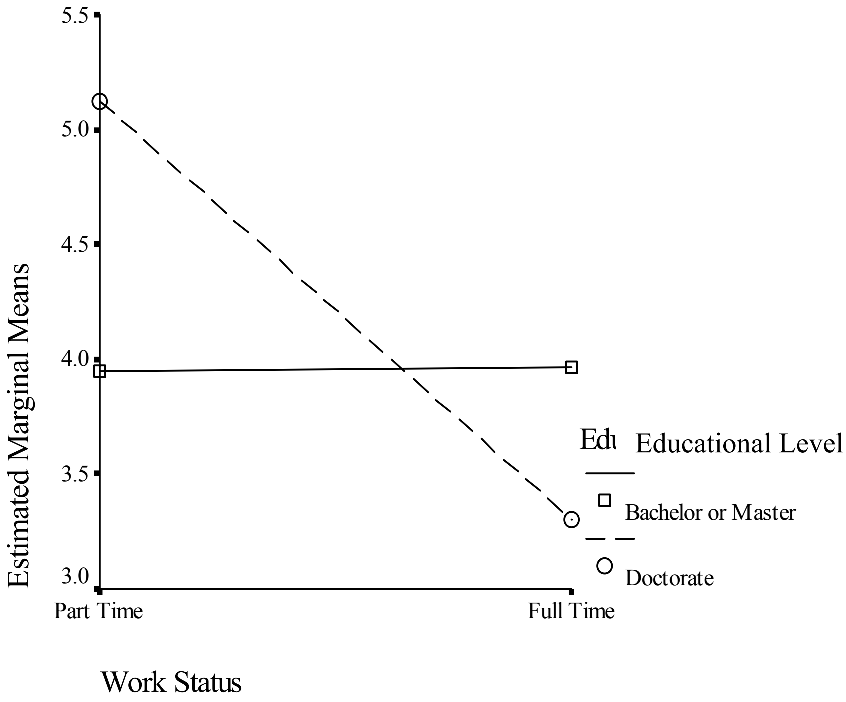
Table 30. Institutional Change Culture Pairwise Comparisons

Dependent Variable	Educational Level	(I) Work Status	(J) Work Status	Mean Difference	Std. Error	Sig. (a)
Institutional Change Culture	Bachelor or Master	Part-time	Full-time	-0.014	0.368	0.971
	Doctorate	**Part-time**	**Full-time**	**1.822 ***	0.531	**0.001**

Based on estimated marginal means.
* The mean difference is significant at the 0.05 level.

The difference between the mean values of part-time faculty with a doctorate and full-time faculty with a doctorate is shown in Figure 11. Part-time professors with a doctorate perceived the Institutional Change Culture—ITESM strong institutional philosophy that promotes innovation, change, and entrepreneurship—as a greater facilitator in implementing the MET than full-time professors with a doctorate.

Figure 11.   Estimated marginal means of institutional change culture



Analysis of Marginally Significant Results

Given the exploratory nature of this study, detailed analysis of marginally significant results related to the three non-major findings are provided next.

Marginal Significance of Work Status by Professional Development/MET Implementation

As indicated earlier, SPSS multivariate tests provided marginally significant results for faculty perceptions relating to Facilitator factors when individual characteristics were taken into consideration.

Specifically, for faculty at different levels of Professional Development/MET Implementation (non-user, inexperienced user, experienced user, experienced-advanced user, or renewing user), there was a marginally significant interaction effect between work status and professional development/MET implementation level (Wilk's Lambda = 0.789 , F = 1.458, df = 24, 497, p = 0.075) relative to the perception of the following Facilitator factors: (a) Students Acceptance of Change, (b) Institutional Change Culture, and (c) Ongoing Support and Training.

As shown in Table 31, the relationship between faculty work status and level of Professional Development/MET Implementation was important due to significant differences between the groups in the following factors: (a) Students Acceptance of Change (F = 2.878, df = 4, 142, p = 0.025), (b) Institutional Change Culture (F = 3.093, df = 4, 142, p = 0.018), and (c) Ongoing Support and Training (F = 3.293, df = 4, 142, p = 0.013).

Table 31. Facilitator Tests of Between-Subjects Effects: Work Status by Professional Development/MET Implementation

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Work Status* Professional Development/ MET Implementation	**Students Acceptance of Change**	11.176	4	2.794	2.878	**0.025**
	Adoption/Adaptation of Courses	8.826	4	2.206	1.698	0.153
	Institutional Change Culture	11.842	4	2.961	3.093	**0.018**
	Ongoing Support and Training	10.333	4	2.583	3.293	**0.013**
	Faculty Academic Background	6.613	4	1.653	1.821	0.128
	Professional Learning Community	4.278	4	1.069	1.280	0.280

SPSS Post Hoc tests were conducted for the Students Acceptance of Change, Institutional Change Culture, and Ongoing Support and Training Facilitator factors to examine how the estimated mean values for work status by professional development/MET implementation level varied. These tests provided more detailed statistical results that facilitated deeper levels of analysis, and are addressed next.

Students Acceptance of Change

Pairwise Comparison Post Hoc tests were conducted for the Facilitator factor *Students Acceptance of Change* to examine how the estimated mean values for work status by professional development/MET implementation level varied. The results shown in Table 32 indicated that there was a significant difference between the mean values of part-time faculty who have advanced to the experienced level (M = 4.847 ± 0.604) and full-time faculty who have advanced to the experienced level (M = 3.032 ± 0.243). Similarly, there was a significant difference between the mean values of part-time renewing users (M = 4.855 ± 0.633) and full-time renewing users (M = 3.430± 0.359).

Table 32. Students Acceptance of Change Pairwise Comparisons

Dependent Variable	Professional Development/MET Implementation	(I) Work Status	(J) Work Status	Mean Difference (I-J)	Std. Error	Sig. (a)
Students Acceptance of Change	Non-user	Part Time	Full Time	-0.130	0.688	0.850
	Inexperienced	Part Time	Full Time	-0.282	0.543	0.604
	Experienced	Part Time	Full Time	**1.815 ***	0.606	**0.003**
	Experienced-Advanced	Part Time	Full Time	-0.001	1.217	0.999
	Renewing User	Part Time	Full Time	**1.425 ***	0.561	**0.012**

Based on estimated marginal means.
* The mean difference is significant at the 0.05 level.
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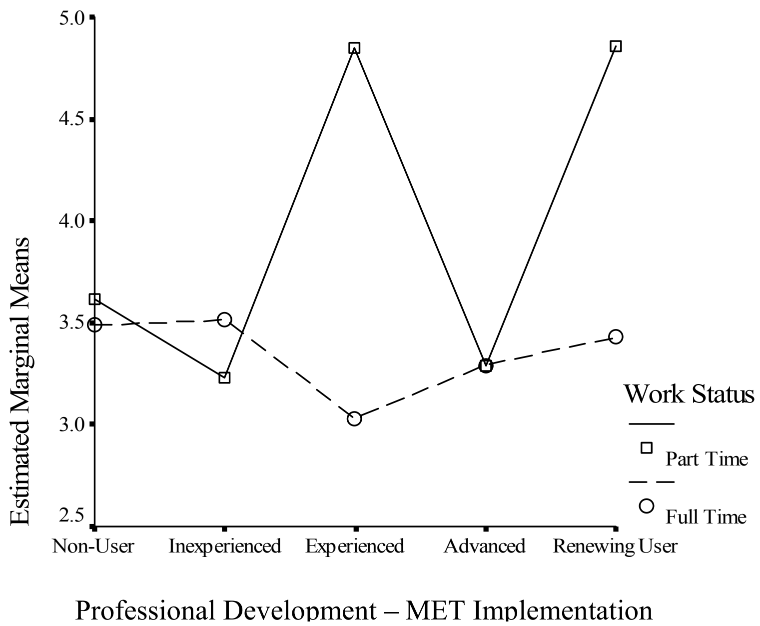
Figure 12 illustrates the difference between the mean values of experienced level part-time faculty and experienced level full-time faculty; it also illustrates the difference between the mean values of part-time renewing users and full-time renewing users.

Part-time professors who have advanced to the experienced user level had a higher perception of the facilitation effect of *Students Acceptance of Change*—ITESM students' trusted participation in and acceptance of educational change and the use of technology—in implementing the MET than full-time experienced user level professors. Similarly, part-time renewing users had a higher perception of the facilitation effect of *Students Acceptance of Change* in implementing the MET than full-time renewing users.

Figure 12. Estimated marginal means of students acceptance of change



Institutional Change Culture

Pairwise Comparison Post Hoc tests were conducted for the Facilitator factor *Institutional Change Culture* to examine how the estimated mean values for work status by professional development/MET implementation level groups varied. The results shown in Table 33 indicated that there was a significant difference between the mean values of experienced level part-time faculty (M = 5.846± 0.600) and experienced level full-time faculty (M = 3.737 ± 0.241).

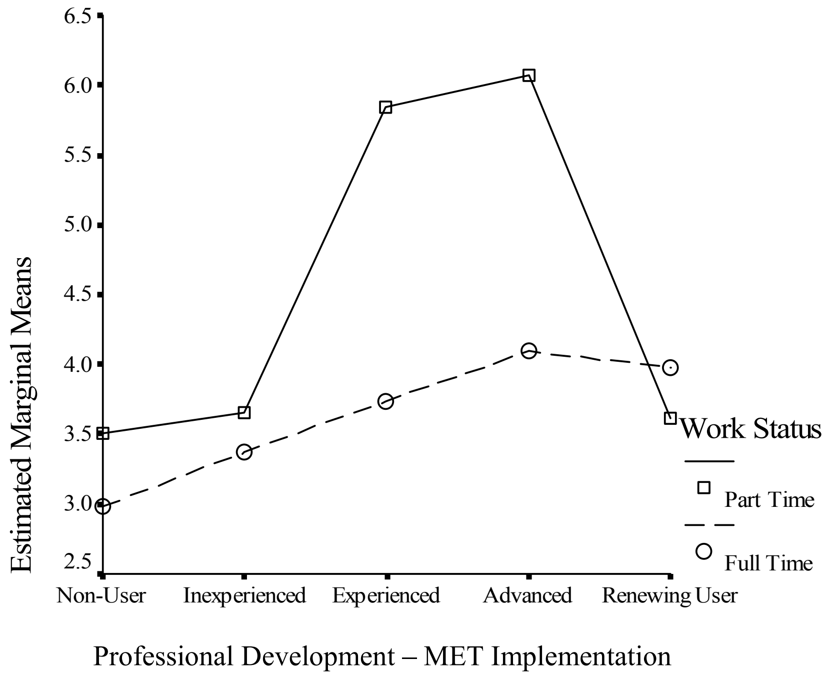
Table 33. Institutional Change Culture Pairwise Comparisons

Dependent Variable	Professional Development/MET Implementation	(I) Work Status	(J) Work Status	Mean Difference (I-J)	Std. Error	Sig. (a)
Institutional Change Culture	Non-user	Part Time	Full Time	-0.532	0.683	0.437
	Inexperienced	Part Time	Full Time	-0.282	0.539	0.606
	Experienced	Part Time	Full Time	**2.110 ***	0.601	**0.001**
	Experienced-Advanced	Part Time	Full Time	1.970	1.208	0.105
	Renewing User	Part Time	Full Time	-0.368	0.557	0.510

Based on estimated marginal means.
* The mean difference is significant at the 0.05 level.

Figure 13 illustrates the difference between the mean values of experienced level part-time faculty and experienced level full-time faculty. The results indicated that experienced level part-time professors perceived a higher facilitation effect of the *Institutional Change Culture*—the ITESM philosophy and values-based culture promoting innovation, change, and entrepreneurial spirit—in implementing the MET than experienced level full-time professors.

Figure 13. Estimated marginal means of institutional change culture



Ongoing Support and Training

Pairwise Comparison Post Hoc tests were conducted for the *Ongoing Support and Training* facilitator factor to examine how the estimated mean values for work status by professional development/MET implementation level groups varied. The results shown in Table 34 indicated that there was a significant difference between the mean values of part-time experienced users (M = 5.095± 0.543) and full-time experienced users (M = 3.198 ± 0.219).

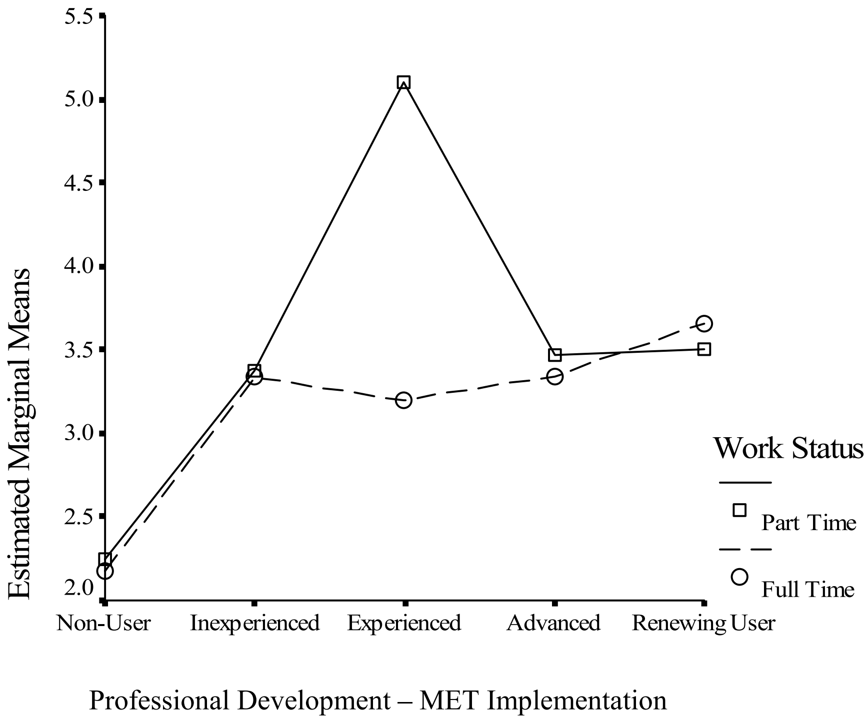
Table 34. Ongoing Support and Training Pairwise Comparisons

Dependent Variable	Professional Development/MET Implementation	(I) Work Status	(J) Work Status	Mean Difference (I-J)	Std. Error	Sig. (a)
Ongoing Support & Training	Non-user	Part Time	Full Time	0.065	0.618	0.917
	Inexperienced	Part Time	Full Time	0.038	0.488	0.938
	Experienced	Part Time	Full Time	**1.897 ***	0.544	**0.001**
	Experienced-Advanced	Part Time	Full Time	0.121	1.094	0.912
	Renewing User	Part Time	Full Time	-0.156	-0.156	0.504

Based on estimated marginal means.
* The mean difference is significant at the 0.05 level.

Differences between the mean values of part-time and full-time faculty that have achieved different levels of Professional Development/MET Implementation are shown in Figure 14. Experienced level part-time professors had a higher perception of the facilitating effect of *Ongoing Support and Training*—support provided by pedagogical and technological advisors from ITESM Learning Technology Centers—in implementing the MET than experienced level full-time professors.

Figure 14. Estimated marginal means of ongoing support and training



Marginal Significance of Years of Teaching at ITESM by Educational Level

For faculty with different educational levels (bachelor or a master's degree vs. doctorate) and years of teaching at the institution (0-2, 3-5, 6-9, or 10 or more years), there was a marginally significant interaction effect between their educational level and years of teaching at ITESM (Wilk's Lambda = 0.832 , F = 1.497, df = 18, 402, p = 0.087) relative to the perception of the following Facilitator factors: (a) Students Acceptance of Change, (b)

Professional Learning Community, (c) Ongoing Support & Training, and (d) Adoption/Adaptation of Courses.

As shown in Table 35, the relationship between faculty years of teaching at ITESM and educational level was important due to significant differences between the groups in the following factors: (a) Students Acceptance of Change (F = 4.806, df = 3, 142, p = 0.003), (b) Professional Learning Community (F = 3.756, df = 3, 147, p = 0.012), (c) Adoption/Adaptation of Courses (F = 3.184, df = 3, 147 p = 0.026), and (d) Ongoing Support and Training (F = 3.020, df = 3, 147 p = 0.032).

Table 35. Facilitator Tests of Between-Subjects Effects: Years of Teaching by Educational Level

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Observed Power (a)
Years of Teaching * Educational Level	**Students Acceptance of Change**	13.998	3	4.666	4.806	**0.003**	0.897
	Adoption/ Adaptation of Courses	12.409	3	4.136	3.184	**0.026**	0.727
	Institutional Change Culture	5.529	3	1.843	1.926	0.128	0.490
	Ongoing Support and Training	7.108	3	2.369	3.020	**0.032**	0.702
	Faculty Academic Background	4.002	3	1.334	1.469	0.225	0.383
	Professional Learning Community	9.414	3	3.138	3.756	**0.012**	0.803

SPSS Post Hoc tests were conducted for the Students Acceptance of Change, Professional Learning Community, Adoption/Adaptation of Courses, and Ongoing Support and Training Facilitator factors to examine how the estimated mean values for years of teaching by educational level groups varied. These tests provided more detailed significant results that facilitated deeper levels of analysis, and are provided next.

Students Acceptance of Change

Pairwise Comparison Post Hoc tests were conducted for the Facilitator factor *Students Acceptance of Change* to examine how the estimated mean values for years of teaching at ITESM by educational level groups varied. The results shown in Table 36 indicated that there was a significant difference between the mean values of faculty with Bachelor or Master ($M = 4.216 \pm 0.277$) and Doctorate ($M = 3.000 \pm 0.458$) with 6-9 years of teaching experience at the institution; and a marginally significant difference between the mean values of faculty with Bachelor or Master ($M = 3.089 \pm 0.299$) and Doctorate ($M = 3.776 \pm 0.424$) with 10 or more years of teaching experience at the institution.

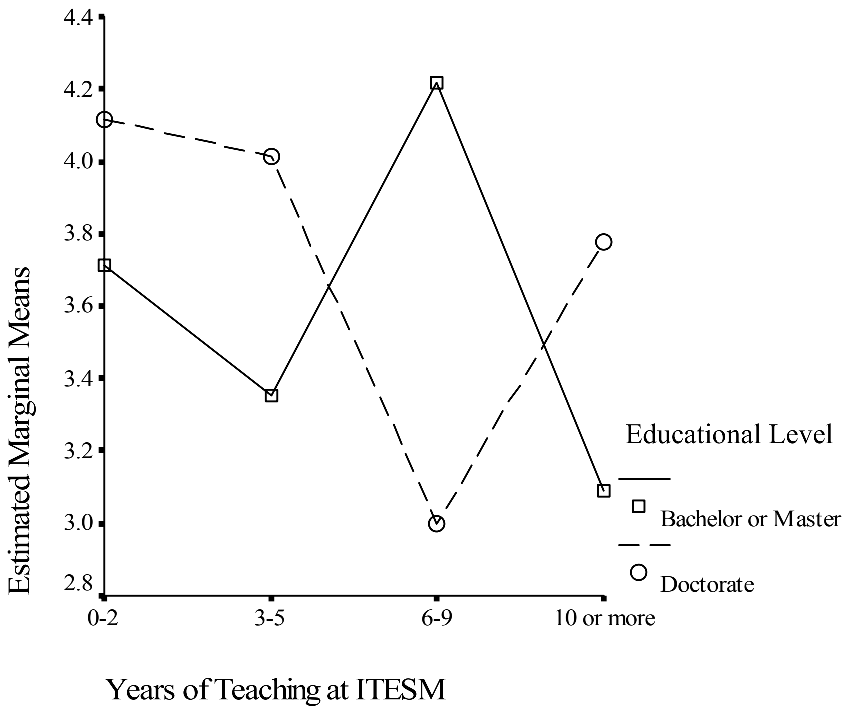
Table 36. Students Acceptance of Change Pairwise Comparisons

Dependent Variable	Years of Teaching at ITESM	Educational Level (I)	Educational Level (J)	Mean Difference (I-J)	Std. Error	Sig. (a)
Students Acceptance of Change	0-2	Bachelor or Master	Doctorate	-0.405	0.602	0.502
	3-5	Bachelor or Master	Doctorate	-0.660	0.435	0.131
	6-9	Bachelor or Master	Doctorate	**1.217 ***	0.505	**0.017**
	10 or more	Bachelor or Master	Doctorate	**-0.687**	0.414	**0.099**

Based on estimated marginal means
* The mean difference is significant at the 0.05 level.

Figure 15 illustrates the differences between the mean values of faculty with Bachelor or Master and faculty with a Doctorate with different years of teaching experience at ITESM. These results surfaced that professors with a bachelor or a master's degree with 6-9 years of teaching experience at ITESM had a higher perception of the facilitation effect of *Students Acceptance of Change*—ITESM students trusted participation in and acceptance of educational change and use of technology—in implementing the MET than professors with a doctorate with the same years of teaching. Professors with a bachelor or a master's degree with 10 or more years of teaching at the institution had a moderately lower perception of the facilitation effect of *Students Acceptance of Change* in implementing the MET as compared with professors with a doctorate with 10 or more years of teaching at the institution.

Figure 15. Estimated marginal means of students acceptance of change



Professional Learning Community

Pairwise Comparison Post Hoc tests were conducted for the Facilitator factor *Professional Learning Community* to examine how the estimated mean values for years of teaching at ITESM by educational level groups varied. The results shown in Table 37 indicated that there was a significant difference between the mean values of faculty with Bachelor or Master (M = 3.268 ± 0.257) and Doctorate (M = 2.263 ± 0.425) with 6-9 years of teaching experience at ITESM; and a marginally significant difference between the mean values of faculty with Bachelor or Master (M = 3.284 ± 0.274) and Doctorate (M = 4.019 ± 0.359) with 3-5 years of teaching experience at the institution.

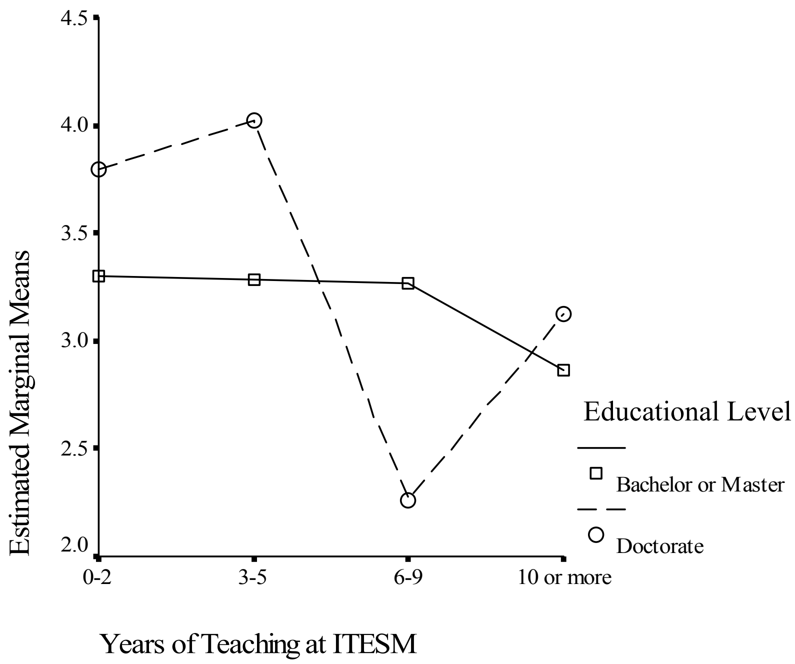
Table 37. Professional Learning Community Pairwise Comparisons

Dependent Variable	Years of Teaching at ITESM	Educational Level (I)	Educational Level (J)	Mean Difference (I-J)	Std. Error	Sig. (a)
Professional Learning Community	0-2	Bachelor or Master	Doctorate	-0.500	0.558	0.372
	3-5	**Bachelor or Master**	**Doctorate**	**-0.735**	0.403	**0.070**
	6-9	**Bachelor or Master**	**Doctorate**	**1.006 ***	0.469	**0.033**
	10 or more	Bachelor or Master	Doctorate	-0.259	0.384	0.501

Based on estimated marginal means
* The mean difference is significant at the 0.05 level.

Figure 16 illustrates the differences between the mean values of faculty with Bachelor or Master and faculty with a Doctorate with different years of teaching experience at ITESM. These results surfaced that professors with a bachelor or a master's degree with 6-9 years of teaching experience at ITESM had a higher perception of the facilitation effect of *Professional Learning Community*—Collegiate work in ITESM system-wide academies and local academic departments; appropriate organizational structure of the institution—in implementing the MET than professors with a doctorate with the same years of teaching at ITESM. Results also surfaced that professors with a doctorate with 3-5 years of teaching at the institution had a moderately higher perception of the facilitation effect of *Professional Learning Community* in implementing the MET than professors with bachelor or a master's degree with 3-5 years of teaching.

Figure 16. Estimated marginal means of professional learning community



Adoption/Adaptation of Courses

Pairwise Comparison Post Hoc tests were conducted for the Facilitator factor *Adoption/Adaptation of Courses* to examine how the estimated mean values for years of teaching at ITESM by educational level groups varied. The results shown in Table 38 indicated that there was a significant difference in the mean values of faculty with Bachelor or Master's degrees (M = 3.658 ± 0.321) and Doctorates (M =2.328 ± 0.530) with 6-9 years of teaching experience at ITESM.

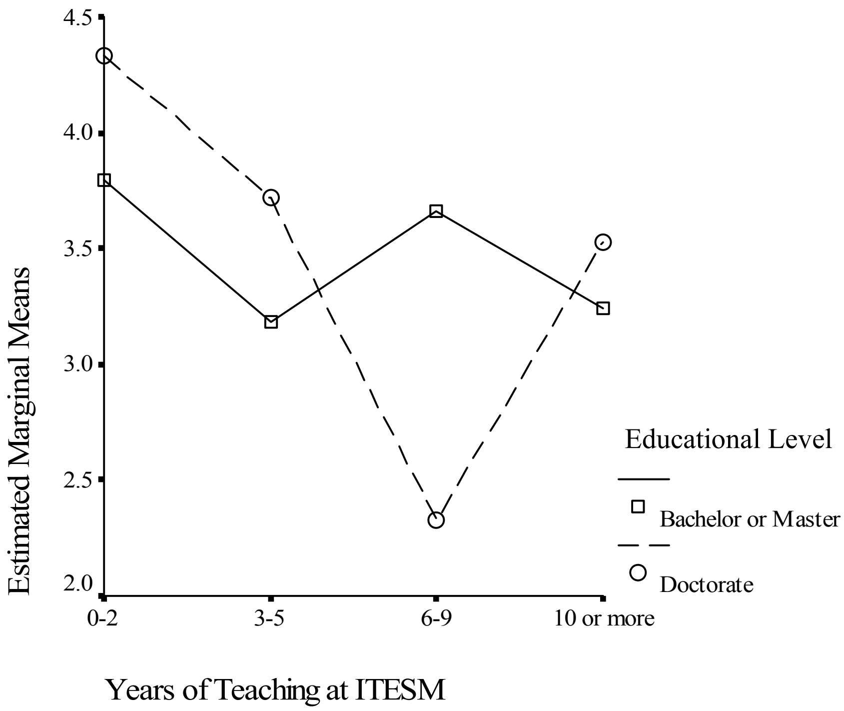
Table 38. Adoption/Adaptation of Courses Pairwise Comparisons

Dependent Variable	Years of Teaching at ITESM	Educational Level (I)	Educational Level (J)	Mean Difference (I-J)	Std. Error	Sig. (a)
Adoption/ Adaptation of Courses	0-2	Bachelor or Master	Doctorate	-0.538	0.696	0.441
	3-5	Bachelor or Master	Doctorate	-0.538	0.503	0.287
	6-9	**Bachelor or Master**	**Doctorate**	**1.330 ***	0.584	**0.024**
	10 or more	Bachelor or Master	Doctorate	-0.288	0.479	0.549

Based on estimated marginal means
* The mean difference is significant at the 0.05 level.

Figure 17 illustrates the differences between the mean values of faculty with Bachelor's or Master's degrees and faculty with a Doctorate with different years of teaching experience at ITESM. These results surfaced that professors with a bachelor's or a master's degree with 6-9 years of teaching experience at the institution had a higher perception of the facilitation effect of *Adoption/Adaptation of Courses*—the possibility for faculty to adopt and make adjustments to system-level high-quality redesigned courses—in implementing the MET than professors with a doctorate with the same years of teaching at the institution.

Figure 17. Estimated marginal means of adoption/adaptation of courses



Ongoing Support and Training

Pairwise Comparison Post Hoc tests were conducted for the factor *Ongoing Support and Training* to examine how the estimated mean values for years of teaching at ITESM by educational level groups varied. The results shown in Table 39 indicated that there was a marginally significant difference between the mean values of faculty with Bachelor or Master's (M = 3.266 ± 0.265) degrees and faculty with doctorates (M = 3.731 ± 0.348) with 6-9 years of teaching at ITESM.

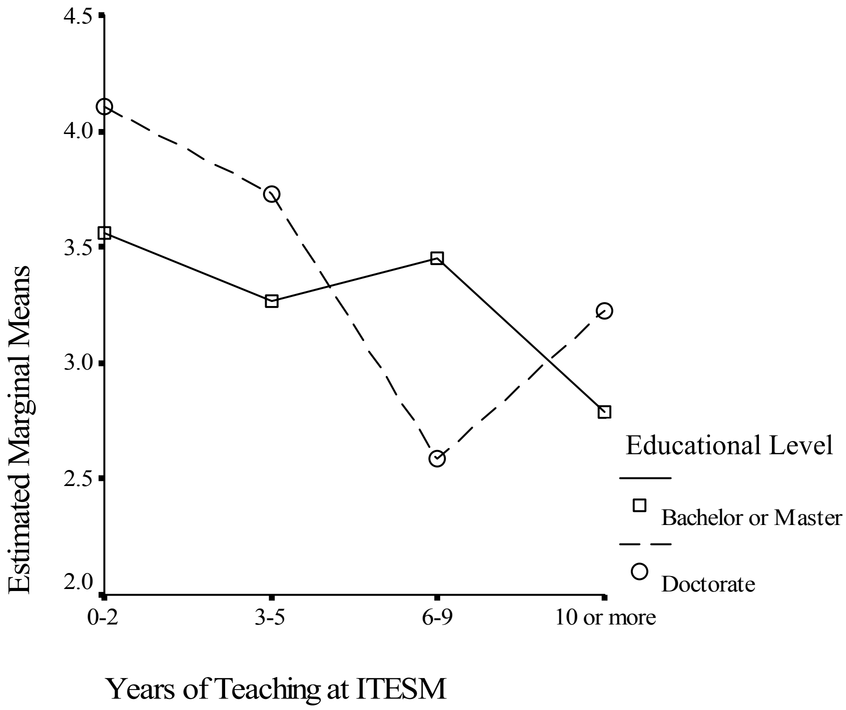
Table 39. Ongoing Support and Training Pairwise Comparisons

Dependent Variable	Years of Teaching at ITESM	Educational Level (I)	Educational Level (J)	Mean Difference (I-J)	Std. Error	Sig. (a)
Ongoing Support & Training	0-2	Bachelor or Master	Doctorate	-0.542	0.541	0.318
	3-5	Bachelor or Master	Doctorate	-0.465	0.391	0.236
	6-9	**Bachelor or Master**	**Doctorate**	**0.867 ***	0.454	**0.058**
	10 or more	Bachelor or Master	Doctorate	-0.433	0.372	0.246

Based on estimated marginal means
* The mean difference is significant at the 0.05 level.

Figure 18 illustrates the differences between the mean values of faculty with Bachelor or Master's degrees and faculty with Doctorates with different years of teaching experience at ITESM. These results surfaced that professors with a bachelor's or a master's degree with 6-9 years of teaching experience at the institution had a moderately higher perception of the facilitation effect of *Ongoing Support and Training*—support provided by pedagogical and technological advisors from ITESM Learning Technology Centers—in implementing the MET as compared with professors with a doctorate with the same years of teaching.

Figure 18. Estimated marginal means of ongoing support & training



Marginal Significance of Academic Unit by Years of Teaching at ITESM

For faculty at different academic units and with different years of teaching at ITESM, there was a marginally significant interaction effect between their academic unit (engineering, business, liberal arts, or high school) and years of teaching at the institution (0-2, 3-5, 6-9, or 10 or more years) [Wilk's Lambda = 0.630 , F = 1.278, df = 54, 729, p = 0.092] relative to the perception of the following Facilitator factors: (a) Professional Learning Community, and (b) Students Acceptance of Change.

As shown in Table 40, the relationship between faculty academic unit and years of teaching at ITESM was important due to significant differences between the groups in the factor: (a) professional learning community (F = 3.116, df = 9, 147, p = 0.002); and marginally significant differences between the groups in the factor: (b) students acceptance of change (F = 1.681, df = 9, 147, p = 0.098).

Table 40. Facilitator Tests of Between-Subjects Effects: Academic Unit by Years of Teaching

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Observed Power (a)
Academic Unit by Years of Teaching	**Students Acceptance of Change**	14.691	9	1.632	1.681	**0.098**	0.755
	Adoption/ Adaptation of Courses	12.921	9	1.436	1.105	0.363	0.532
	Institutional Change Culture	11.942	9	1.327	1.386	0.199	0.652
	Ongoing Support and Training	11.445	9	1.272	1.621	0.114	0.736
	Faculty Academic Background	8.749	9	0.972	1.070	0.388	0.516
	Professional Learning Community	23.433	9	2.604	3.116	**0.002**	0.972

SPSS Post Hoc tests were conducted for the Professional Learning Community and Students Acceptance of Change Facilitator factors to examine how the estimated mean values for academic unit by years of teaching at ITESM groups varied. These tests provided more detailed results that facilitated deeper levels of analysis, and are provided next.

Professional Learning Community

Pairwise Comparison Post Hoc tests were conducted for the Facilitator factor *Professional Learning Community* to examine how the estimated mean values for academic unit by years of teaching at ITESM groups varied. The results shown in Table 41 indicated significant differences surfaced between groups in Liberal Arts, Engineering, and High School.

Specifically, there was a significant difference between **Engineering** faculty with 3-5 years of teaching at ITESM ($M = 3.583 \pm 0.317$) when compared to faculty with 6-9 years of teaching experience at the institution ($M = 1.946 \pm 0.420$); also between **Engineering** faculty with 0-2 years of teaching at ITESM ($M = 3.914.605 \pm 0.583$) when compared to faculty with 6-9 years of teaching at the institution ($M = 1.946 \pm 0.420$). Significant differences were found in **High School** faculty with 3-5 years of teaching at ITESM ($M = 4.674 \pm 0.563$) when compared to faculty with 6-9 years of teaching at the institution ($M = 2.829 \pm 0.629$). Finally, there was a significant difference between **Liberal Arts** faculty with 6-9 years of teaching at ITESM ($M = 3.705 \pm 0.326$) when compared to faculty with 10 or more years of teaching at the institution ($M = 2.570 \pm 0.420$).

Table 41. Professional Learning Community Pairwise Comparison

Dependent Variable	Academic Unit	(I) Years of Teaching at ITESM	(I) Years of Teaching at ITESM	Mean Difference (I-J)	Std. Error	Sig. (a)
Professional Learning Community	**Liberal Arts**	0-2	3-5	-0.333	0.608	1.000
			6-9	-0.832	0.599	1.000
			10 or more	0.304	0.688	1.000
		3-5	0-2	0.333	0.608	1.000
			6-9	-0.499	0.406	1.000
			10 or more	0.636	0.428	0.836
		6-9	0-2	0.832	0.599	1.000
			3-5	0.499	0.406	1.000
			10 or more	**1.136**	**0.443**	**0.068**
		10 or more	0-2	-0.304	0.668	1.000
			3-5	-0.636	0.428	0.836
			6-9	**-1.136**	**0.443**	**0.068**
	Engineering	0-2	3-5	0.331	0.678	1.000
			6-9	**1.968 ***	0.731	**0.048**
			10 or more	1.227	0.659	0.338
		3-5	0-2	-0.331	0.678	1.000
			6-9	**1.637 ***	0.445	**0.002**
			10 or more	0.896	0.417	0.201
		6-9	**0-2**	**-1.968 ***	0.731	**0.048**
			3-5	**-1.637 ***	0.445	**0.002**
			10 or more	-0.742	0.486	0.776
		10 or more	0-2	-1.227	0.659	0.388
			3-5	-0.896	0.417	0.201
			6-9	0.742	0.486	0.776
	Business	0-2	3-5	-0.034	0.520	1.000
			6-9	0.526	0.601	1.000
			10 or more	0.095	0.531	1.000
		3-5	0-2	0.034	0.520	1.000
			6-9	0.559	0.515	1.000
			10 or more	0.129	0.411	1.000
		6-9	0-2	-0.526	0.601	1.000
			3-5	-0.559	0.515	1.000
			10 or more	-0.431	0.509	1.000
		10 or more	0-2	-0.095	0.531	1.000
			3-5	-0.129	0.411	1.000
			6-9	0.431	0.509	1.000

(table continues)

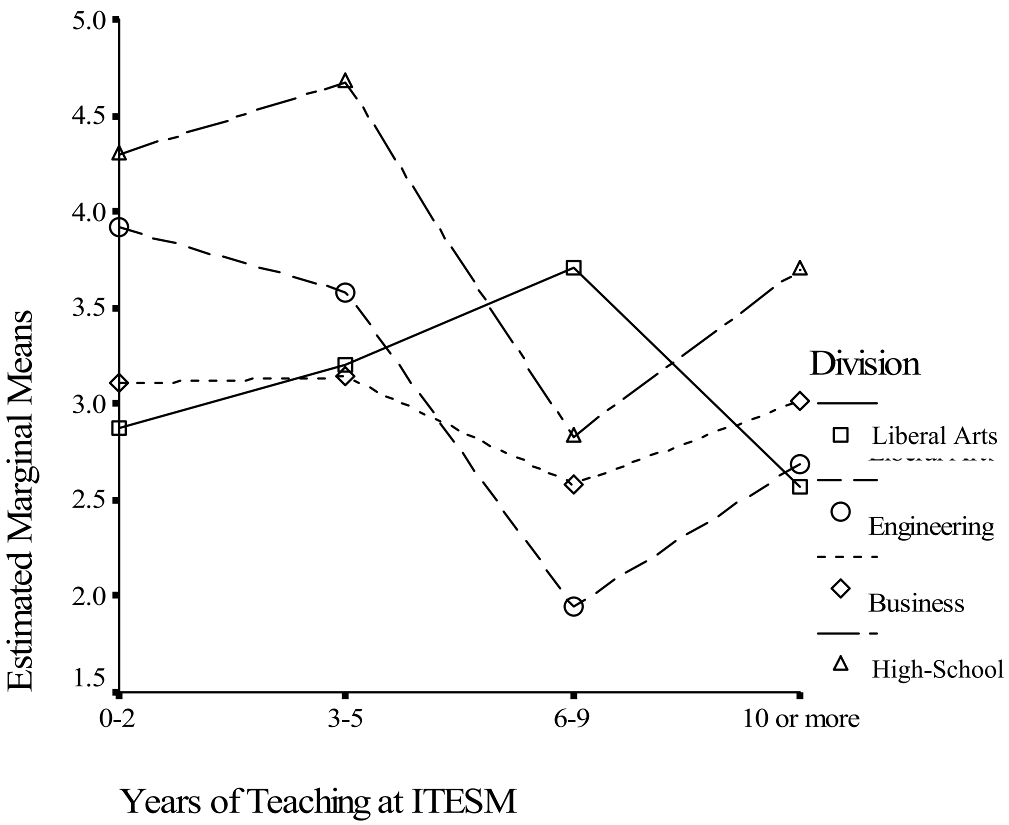
Dependent Variable	Academic Unit	(I) Years of Teaching at ITESM	(I) Years of Teaching at ITESM	Mean Difference (I-J)	Std. Error	Sig. (a)
Professional Learning Community	**High School**	0-2	3-5	-0.377	0.674	1.000
			6-9	1.468	0.758	0.327
			10 or more	0.597	0.705	1.000
		3-5	0-2	0.377	0.674	1.000
			6-9	**1.845 ***	0.622	**0.021**
			10 or more	0.974	0.544	0.451
		6-9	0-2	-1.468	0.758	0.327
			3-5	**1.845 ***	0.622	**0.021**
			10 or more	-0.871	0.687	1.000
		10 or more	0-2	-0.597	0.705	1.000
			3-5	-0.974	0.544	0.451
			6-9	0.871	0.687	1.000

Based on estimated marginal means.
* The mean difference is significant at the 0.05 level.

Figure 19 illustrates the differences between the mean values of faculty at different academic units with different years of teaching experience at ITESM. These results surfaced that Engineering professors with 3-5 years of teaching experience at the institution had a higher perception of the facilitation effect of Pro*fessional Learning Community*—collegiate work in ITESM system-wide academies and local academic departments. Appropriate organizational structure of the institution—in implementing the MET than professors with 6-9 years of teaching at ITESM.

Likewise, High School teachers with 3-5 years of teaching experience at ITESM had a higher perception of the facilitation effect of *Professional Learning Community* in implementing the MET than teachers with 6-9 years of teaching experience at the institution. Liberal Arts professors with 6-9 years of teaching at ITESM had a higher perception of the facilitating effect of *Professional Learning Community* in implementing the MET than professors with 10 or more years of teaching experience at the institution.

Figure 19.   Estimated marginal means of professional learning community



Students Acceptance of Change

Pairwise Comparison Post Hoc tests were conducted for the Facilitator factor *Students Acceptance of Change* to examine how the estimated mean values for academic unit by years of teaching at ITESM groups varied. The results shown in Table 42 indicated that there was a marginally significant difference between the mean values of High School teachers with 0-2 years of teaching at ITESM (M = 4.729 ± 0.725) and teachers with 6-9 years of teaching at the institution (M = 2.672 ± 0.678).

Table 42. Students Acceptance of Change Pairwise Comparisons

Dependent Variable	Academic Unit	(I) Years of Teaching at ITESM	(I) Years of Teaching at ITESM	Mean Difference (I-J)	Std. Error	Sig. (a)
Students Acceptance of Change	Liberal Arts	0-2	3-5	0.171	0.655	1.000
			6-9	-0.597	0.645	1.000
			10 or more	-0.026	0.720	1.000
		3-5	0-2	-0.171	0.655	1.000
			6-9	-0.769	0.437	0.485
			10 or more	-0.197	0.462	1.000
		6-9	0-2	0.597	0.645	1.000
			3-5	0.769	0.437	0.485
			10 or more	0.571	0.478	1.000
		10 or more	0-2	0.026	0.720	1.000
			3-5	0.197	0.462	1.000
			6-9	-0.571	0.478	1.000

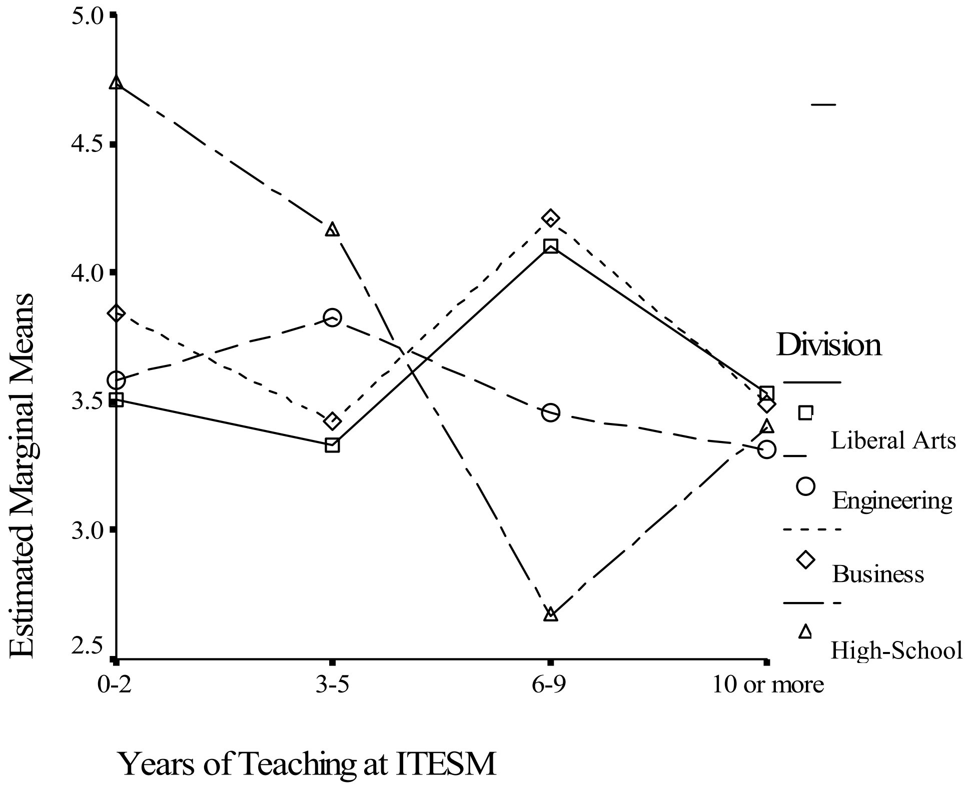
(table continues)

Dependent Variable	Academic Unit	(I) Years of Teaching at ITESM	(I) Years of Teaching at ITESM	Mean Difference (I-J)	Std. Error	Sig. (a)
Students Acceptance of Change	Engineering	0-2	3-5	-0.238	0.731	1.000
			6-9	0.131	0.788	1.000
			10 or more	0.272	0.710	1.000
		3-5	0-2	0.238	0.731	1.000
			6-9	0.369	0.480	1.000
			10 or more	0.510	0.450	1.000
		6-9	0-2	-0.131	0.788	1.000
			3-5	-0.369	0.480	1.000
			10 or more	0.141	0.524	1.000
		10 or more	0-2	-0.272	0.710	1.000
			3-5	-0.510	0.450	1.000
			6-9	-0.141	0.524	1.000
	Business	0-2	3-5	0.425	0.560	1.000
			6-9	-0.361	0.648	1.000
			10 or more	0.353	0.573	1.000
		3-5	0-2	-0.425	0.560	1.000
			6-9	-0.786	0.556	0.954
			10 or more	-0.073	0.443	1.000
	Business	6-9	0-2	0.361	0.648	1.000
			3-5	0.786	0.556	0.954
			10 or more	0.714	0.549	1.000
		10 or more	0-2	-0.353	0.573	1.000
			3-5	0.073	0.443	1.000
			6-9	-0.714	0.549	1.000
	High School	0-2	3-5	0.566	0.727	1.000
			6-9	2.057	0.817	**0.077**
			10 or more	1.333	0.760	0.488
		3-5	0-2	-0.566	0.727	1.000
			6-9	1.491	0.670	0.166
			10 or more	0.768	0.586	1.000
		6-9	**0-2**	-2.057	0.817	**0.077**
			3-5	-1.491	0.670	0.166
			10 or more	-0.723	0.740	1.000
		10 or more	0-2	-1.333	0.760	0.488
			3-5	-0.768	0.586	1.000
			6-9	0.723	0.740	1.000

Based on estimated marginal means.
* The mean difference is significant at the 0.05 level.

Figure 20 illustrates the differences between the mean values of faculty at different academic units with different years of teaching experience at ITESM. These results surfaced that High School teachers with 0-2 years of teaching at the institution had a marginally higher perception of the facilitation effect of *Students Acceptance of* Change—ITESM students' trusted participation in and acceptance of educational change and the use of technology—in implementing the MET than teachers with 6-9 years of teaching at ITESM.

Figure 20. Estimated marginal means of students acceptance of change



A summary of significant results (main effects and interaction effects) for RQ1: Facilitator Perceptions is provided in Table 43.

Table 43. Summary of Significant Results for RQ1: Facilitator Perceptions

Facilitator Perceptions (MANOVA Analysis)	
0. Prof. Dev./MET Imp. (Main Effect)	**(p = 0.007)**
• Ongoing Support & Training	(p = 0.015)
• Institutional Change Culture	(p = 0.027)
• Adoption/Adaptation of Courses	(p = 0.052)
• Faculty Academic Background	(p = 0.053)
1. Work Status by Educational Level	**(p = 0.005)**
• Faculty Academic Background	(p = 0.000)
• Institutional Change Culture	(p = 0.003)
• Students Acceptance of Change	(p = 0.032)
2. Work Status by Prof. Dev./MET Imp.	**(p = 0.075)**
• Ongoing Support & Training	(p = 0.013)
• Institutional Change Culture	(p = 0.018)
• Students Acceptance of Change	(p = 0.025)
3. Years of Teaching by Educational Level	**(p = 0.087)**
• Students Acceptance of Change	(p = 0.003)
• Professional Learning Community	(p = 0.012)
• Adoption/Adaptation of Courses	(p = 0.026)
• Ongoing Support & Training	(p = 0.032)
4. Academic Unit by Years of Teaching	**(p = 0.092)**
• Professional Learning Community	(p = 0.002)
• Students Acceptance of Change	(p = 0.098)

Non-significant Main Effects and Interaction Effects

SPSS multivariate tests provided non-significant results of faculty perceptions relating to Facilitator factors when faculty individual characteristics were taken into consideration. Statistically non-significant results were obtained from faculty individual characteristics' main effects and interaction effects relating to six Facilitator factors.

The following independent variables (IV) did not achieve significant main effects in the MANOVA analysis: work status, academic unit, years of teaching at ITESM, educational level, and gender (see Appendix D, Table D2: *Facilitator Multivariate Tests)*.

Similarly, the following independent variables (IVs) interactions did not achieve significance in the MANOVA analysis: work status by academic unit, work status by years of teaching at ITESM, work status by gender, academic unit by professional development/MET implementation level, academic unit by educational level, and academic unit by gender (see Appendix D, Table D2: *Facilitator Multivariate Tests)*.

Data analysis and obtained results for the study's Barrier factors is provided next.

HYPOTHESIS 1B: BARRIERS ANALYSIS

As indicated earlier, Hypothesis 1 was divided into two sub-hypotheses. Hypothesis 1 was tested using two separate multivariate analysis of variance (MANOVA) analyses: Hypothesis 1a for Facilitators and Hypothesis 1b for Barriers.

Hypothesis 1b examined whether faculty at different levels of adoption had significantly different perceptions of Barriers to the implementation of the ITESM Educational Model when their individual characteristics were taken into consideration. Analysis for Hypothesis 1b was conducted through a 2 (Work Status Group) by 5 (Professional Development/MET Implementation Level) by 4 (Academic Unit) by 4 (Years of Teaching at ITESM) by 2 (Educational Level) by 2 (Gender) MANOVA with 8 Barrier factors scores as dependent variables (DVs).

This MANOVA analysis was performed to examine the main effects and the interaction effects of categorical variables as predictors (i.e., independent variables) on multiple interval dependent variables. In Hypothesis 1b, MANOVA was used to compare groups formed by six categorical independent variables (IVs) to group differences in a set of eight interval Barrier dependent variables (DVs).

Specifically, the six categorical independent variables or predictors in the MANOVA for Hypothesis 1b were as follows: (1) Work Status Group, (2) Professional Development/MET Implementation Level, (3) Academic Unit, (4) Years of Teaching at ITESM, (5) Educational Level, and (6) Gender.

The dependent variables for Hypothesis 1b were the following eight Barrier factors: (1) Monitor Implementation, (2) Top-Down Leadership, (3) Students Adaptation to Change, (4) Infrastructure Operational Problems, (5) Time, (6) Administrative Alignment and Support, (7) Support Shortcomings, and (8) Faculty Issues. A more detailed description of the dependent variables (DVs) and independent variables (IVs) for Hypothesis 1b is provided in Chapter 3.

Table 44 provides a summary of the Barrier Analysis for Hypothesis 1b (RQ1).

Table 44. Summary of Barrier Analysis for Hypothesis 1b (RQ1)

RQ1: What are faculty perceptions of barriers to the implementation of the ITESM Educational Model (MET)?

Hypothesis 1b. It was hypothesized that faculty at different levels of adoption will have significantly different perceptions of the barriers to the implementation of the ITESM Educational Model when individual characteristics are taken into consideration.

Statistical Analysis for Hypothesis 1b: Multivariate Analysis of Variance (MANOVA)

1b) **Barrier Factors (DVs)**

1. Monitor Implementation
2. Top-Down Leadership
3. Students Adaptation to Change
4. Infrastructure Operational Problems
5. Time
6. Administrative Alignment & Support
7. Support Shortcomings
8. Faculty Issues

Predictors (IVs)

1. Professional Development/MET Implementation Level
    - Non-User
    - Inexperienced User
    - Experienced User
    - Experienced-Advanced User
    - Renewing User

Demographics

2. Work Status Group (Part-Time or Full-Time)
3. Academic Unit (Engineering, Business, Liberal Arts, or High School)
4. Educational Level (Bachelor or Master's degree, or Doctorate)
5. Years of Teaching at ITESM (0-2, 3-5, 6-9, or 10 years or more)
6. Gender (Male or Female)

BARRIERS DATA ANALYSES AND OBTAINED RESULTS

A MANOVA (with a Bonferroni-test adjusted α based on the number of dependent variables) was conducted in order to determine how faculty perceptions of Barriers varied across the five implementation levels of the ITESM Educational Model when the following individual characteristics were taken into consideration: (1) Work Status Group, (2) Professional Development/MET Implementation Level, (3) Academic Unit, (4) Years of Teaching at ITESM, (5) Educational Level, and (6) Gender.

Barrier Factors Mean Responses

SPSS descriptive statistics provided the participants' perception mean responses and standard deviations for the eight dependent Barrier factors. Table 45 provides the faculty perception mean responses[20] for each dependent Barrier factor, ranked from the highest to the lowest values. Perception mean responses within the 4-5 range were high values, whereas perception mean responses within the 1-2 range were low values. Faculty perception mean responses within the 3's range were moderate. As shown in this table, faculty perception mean responses were the following for each dependent Barrier factor: (1) Monitor Implementation: 3.2138, (2) Top-Down Leadership: 3.7402, (3) Students

[20] Faculty perceptions for these barrier factors were collected via a Likert-type scale instrument containing 71 close-ended questions with a five point scale ranging from: 1) None, 2) A little bit, 3) Some, 4) A lot, and 5) Very Much.

Adaptation to Change: 3.5321, (4) Infrastructure Operational Problems: 3.5594, (5) Time: 3.3700, (6) Administrative Alignment and Support: 3.5495, (7) Support Shortcomings: 3.0026, and (8) Faculty Issues: 2.8597 (see Appendix D, Table D3).

Table 45. Faculty Perception Mean Responses for Barrier Factors

Barrier Factors (Name)	Barrier Factors (Description)	Perceptions (Mean Response)
1. Top-Down Leadership	ITESM's centralized decision-making process promotes upper level decisions.	3.7402
2. Infrastructure Operational Problems	Proper operation of technological platforms, computational servers operational failures, and maintenance of IT infrastructure.	3.5594
3. Administrative Alignment and Support	Academic units and administrative areas have different objectives and lack of alignment of administrative processes with the MET. Academic administrators' understanding of the MET.	3.5495
4. Students Adaptation to Change	Students' lack of new learning habits and adaptation to working collaboratively. Students' apathy towards ITESM's new teaching-learning process.	3.5321
5. Time	Lack of time for continuous course improvement and interaction with students. Lack of time to become involved in the change process and for feedback during the implementation process. Time required to fully understand the MET.	3.3700

(table continues)

Barrier Factors (Name)	Barrier Factors (Description)	Perceptions (Mean Response)
6. Monitor Implementation	Lack of institutional evaluation of the MET implementation and lack of classroom monitoring to improve the MET.	3.2138
7. Support shortcomings	Support deficiencies during the implementation process. Lack of support from technological and pedagogical advisors.	3.0026
8. Faculty issues	Change resistance to new educational paradigms and to new faculty roles. Faculty skepticism about the effectiveness of the MET. Required use of didactic methods in redesigned courses.	2.8597

These results surfaced the relative importance of the Barrier factors as perceived by the faculty. Professors at the Mexico City campus of ITESM perceived the institutional Top-Down Leadership—ITESM centralized decision-making process promoting upper level decisions—as the highest-valued Barrier factor (mean value = 3.74) in implementing the MET, and Faculty Issues—change resistance to new educational paradigms and to new faculty roles; faculty skepticism about the effectiveness of the MET; and required use of didactic methods in redesigned courses—as the lowest-valued Barrier factor (mean value = 2.85).

Faculty Perceptions of Barriers

The MANOVA analysis for Hypothesis 1b was performed to examine the main effects and the interaction effects of categorical variables as predictors (i.e., independent variables) on multiple interval dependent variables. SPSS multivariate tests provided significant results of faculty perceptions relating to Barrier factors when individual characteristics were taken into consideration. Statistically significant results and marginally significant results were obtained from faculty individual characteristics' main effects and interaction effects related to the eight Barrier factors. Although marginally significant results are not as important as significant ones, they are provided due to the exploratory nature of the study.

Significant results surfaced the following **major** finding:

1. Faculty at the Mexico City campus of ITESM had significantly different perceptions of Barriers when their work status (full-time vs. part-time) and professional development/MET implementation level (non-user, inexperienced user, experienced user, experienced-advanced user, or renewing user) were taken into consideration relative to the following Barrier factors: (a) Support Shortcomings, (b) Infrastructure Operational Problems, and (c) Administrative Alignment and Support (see Appendix D, Table D4: *Barrier Multivariate Tests*).

Analysis of Significant Results

Detailed analyses of significant results related to this major finding is provided next.

Significance of Work Status and Professional Development/MET Implementation

As indicated above, SPSS multivariate tests provided significant results for faculty perceptions relating to Barrier factors when individual characteristics were taken into consideration.

For faculty at different levels of implementation of the MET there was a significant interaction effect between work status and professional development/MET implementation level (Wilk's Lambda = 0.743 , F = 1.504, df = 32, 573, p = 0.039) relative to the perception of the following Barrier factors: (a) Support Shortcomings, (b) Infrastructure Operational Problems, and (c) Administrative Alignment and Support.

As shown in Table 46, the relationship between faculty work status and professional development/MET implementation level was important due to significant differences between the Barrier factors: (a) Support Shortcomings (F = 3.113, df = 4, 162, p = 0.01), and marginally significant differences between (b) Infrastructure Operational Problems (F = 2.346, df = 4, 162, p = 0.057), and (c) Administrative Alignment and Support (F = 2.026, df = 4, 162, p = 0.093).

Table 46. Barrier Tests of Between-Subjects Effects: Work Status by Professional Development/MET Implementation

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Observed Power (a)
Work Status* Professional Development	Monitor Implementation	7.351	4	1.838	1.350	0.254	0.415
	Top-Down Leadership	3.443	4	0.861	1.079	0.369	0.335
	Students Adaptation to Change	5.553	4	1.388	1.050	0.383	0.326
	Infrastructure Operational Problems	8.756	4	2.189	2.346	**0.057**	0.670
	Time	2.680	4	0.670	0.694	0.597	0.222
	Administrative Alignment Support	7.871	4	1.968	2.026	**0.093**	0.597
	Support Shortcomings	12.453	4	3.113	3.409	**0.010**	0.845
	Faculty Issues	6.068	4	1.517	1.897	0.113	0.565

SPSS Post Hoc tests were conducted for the Infrastructure Operational Problems, Administrative Alignment Support, and Support Shortcomings factors to examine how the estimated mean values for work status by professional development/MET implementation level varied. These tests provided more detailed results that facilitated deeper levels of analysis, and are addressed next.

Support Shortcomings

Pairwise Comparison Post Hoc tests were conducted for the Barrier factor *Support Shortcomings* to examine how the estimated mean values for work status by professional development/MET implementation level groups varied. The results shown in Table 47 indicated that there was a significant difference between the mean values of inexperienced level part-time faculty (M = 3.401 ± 0.299) and inexperienced level full-time faculty (M = 2.355 ± 0.431). Similarly, there was a significant difference between the mean values of advanced level part-time faculty (M = 0.452 ± 1.179) and advanced level full-time faculty (M = 2.889 ± 0.192). **Note**: M (Mean) values are reported ± SE (standard error).

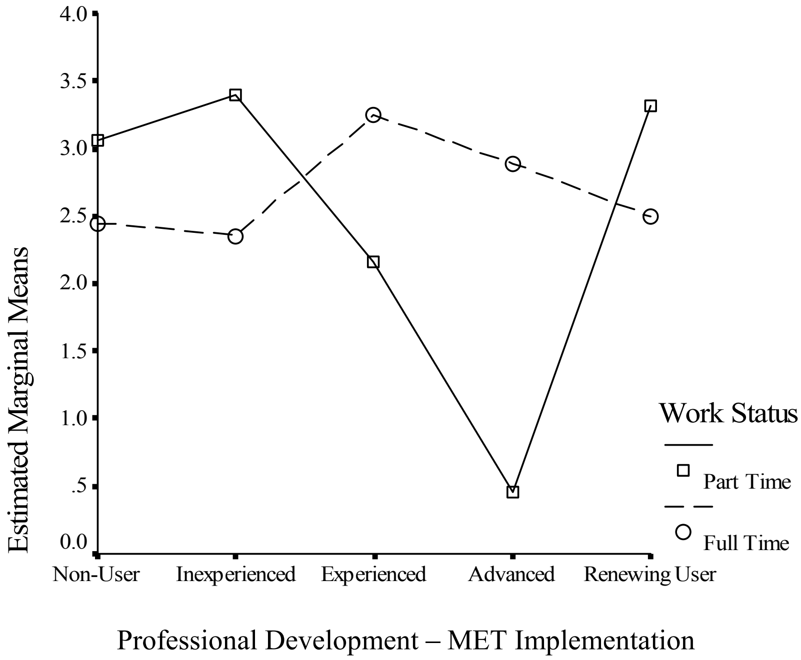
Table 47. Support Shortcomings Pairwise Comparisons

Dependent Variable	Professional Development/MET Implementation	(I) Work Status	(J) Work Status	Mean Difference (I-J)	Std. Error	Sig. (a)
Support Shortcomings	Non-user	Part Time	Full Time	0.614	0.777	0.431
	Inexperienced	Part Time	Full Time	**1.046 ***	**0.528**	**0.049**
	Experienced	Part Time	Full Time	-1.085	0.694	0.120
	Experienced-Advanced	Part Time	Full Time	**-2.438 ***	**1.170**	**0.039**
	Renewing User	Part Time	Full Time	0.821	0.587	0.164

Based on estimated marginal means.
* The mean difference is significant at the 0.05 level.

Differences between the mean values of part-time and full-time faculty that have achieved different levels of Professional Development/MET Implementation are shown in Figure 21. Inexperienced part-time professors perceived *Support Shortcomings*—support deficiencies during the implementation process and lack of support from technological and pedagogical advisors—as a higher barrier in implementing the MET than inexperienced level full-time professors. Similarly, advanced level part-time professors perceived *Support Shortcomings* as a lower barrier in implementing the MET than advanced level full-time professors.

Figure 21. Estimated marginal means of support shortcomings



Infrastructure Operational Problems

Pairwise Comparison Post Hoc tests were conducted for the Barrier factor *Infrastructure Operational Problems* to examine how the estimated mean values for work status by professional development/MET implementation level groups varied. The results shown in Table 48 indicated that there was a significant difference between the mean values of advanced level part-time faculty (M = 0.675 ± 1.192) and advanced level full-time faculty (M = 3.640 ± 0.194). Additionally, moderately significant differences were found between non-user level part-time faculty (M = 4.726 ± 0.649) and non-user level full-time faculty (M = 3.239 ± 0.562).

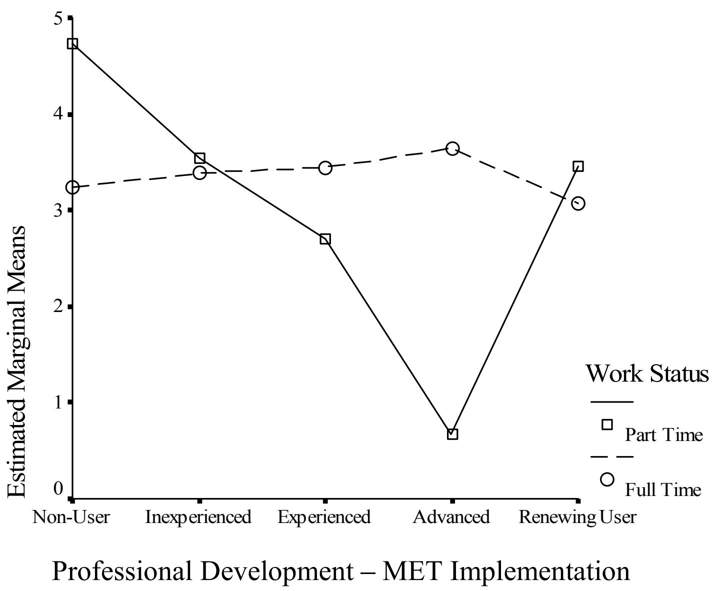
Table 48. Infrastructure Operational Problems Pairwise Comparisons

Dependent Variable	Professional Development/MET Implementation	(I) Work Status	(J) Work Status	Mean Difference (I-J)	Std. Error	Sig. (a)
Infrastructure Operational Problems	**Non-user**	Part Time	Full Time	1.487	0.785	**0.075**
	Inexperienced	Part Time	Full Time	0.154	0.534	0.312
	Experienced	Part Time	Full Time	-0.746	0.702	1.586
	Experienced-Advanced	Part Time	Full Time	**-2.965 ***	1.182	**0.013**
	Renewing User	Part Time	Full Time	0.389	0.594	0.514

Based on estimated marginal means.
* The mean difference is significant at the 0.05 level.

Differences between the mean values of part-time and full-time faculty that have achieved different levels of Professional Development/MET Implementation are shown in Figure 22. Significant differences indicated that advanced level part-time professors perceived *Infrastructure Operational Problems*—proper operation of technological platforms, computational servers' operational failures, and maintenance of IT infrastructure—as a lower barrier to implement the MET than advanced level full-time professors. Likewise, marginally significant differences indicated that non-user level part-time professors perceived Infrastructure Operational Problems as a higher barrier to implement the MET than non-user level full-time professors.

Figure 22. Estimated marginal means of infrastructure operational problems



Administrative Alignment and Support

Pairwise Comparison Post Hoc tests were conducted for the Barrier factor *Administrative Alignment and Support* to examine how the estimated mean values for work status by professional development/MET implementation level groups varied. The results shown in Table 49 indicated that there was a significant difference between the mean values of part-time experienced users (M = 1.934 ± 0.716) and full-time experienced users (M = 3.820 ± 0.239).

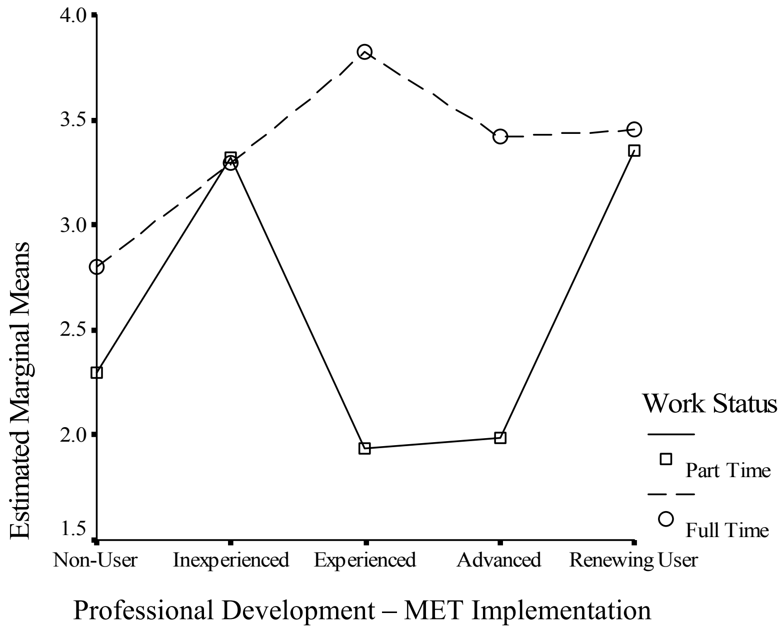
Table 49. Administrative Alignment and Support Pairwise Comparisons

Dependent Variable	Professional Development/MET Implementation	(I) Work Status	(J) Work Status	Mean Difference (I-J)	Std. Error	Sig. (a)
Administrative Alignment & Support	Non-user	Part Time	Full Time	-0.498	0.801	0.535
	Inexperienced	Part Time	Full Time	0.031	0.545	0.955
	Experienced	Part Time	Full Time	**-1.886 ***	**0.716**	**0.009**
	Experienced-Advanced	Part Time	Full Time	-1.434	1.206	0.236
	Renewing User	Part Time	Full Time	-0.095	0.606	0.876

Based on estimated marginal means.
* The mean difference is significant at the 0.05 level.

Differences between the mean values of part-time and full-time faculty that have achieved different levels of Professional Development/MET Implementation are shown in Figure 23. Significant results surfaced that full-time experienced users perceived *Administrative Alignment and Support*—academic units and administrative areas having different objectives; lack of alignment of administrative processes with the MET; and academic administrators' understanding of the MET—as a higher barrier in implementing the ITESM Educational Model than part-time experienced users.

Figure 23. Estimated marginal means of administrative alignment and support



A summary of significant results with main effects and interaction effects for RQ1: Barriers Perceptions is provided in Table 50.

Table 50. Summary of Significant Results for RQ1: Barrier Perceptions

Barrier Perceptions (MANOVA Analysis)	
0. No independent variable (IV) with significant Main Effect	
1. Work Status by Professional Development/MET Implementation	**(p = 0.039)**
• Support Shortcomings	(p = 0.010)
• Infrastructure Operational Problems	(p = 0.057)
• Administrative Alignment & Support	(p = 0.093)

Non-significant Main Effects and Interaction Effects

SPSS multivariate tests provided non-significant results of faculty perceptions relating to Barrier factors when faculty individual characteristics were taken into consideration. Statistically non-significant results were obtained from faculty individual characteristics' main effects and interaction effects relating to eight Barrier factors.

None of the independent variables (IVs)—work status, professional development/MET implementation level, academic unit, years of teaching at ITESM, educational level, and gender—reached main significance effect in the MANOVA analysis. Similarly, the independent variables interaction effects that did not reach significance were: work status by academic unit, work status by years of teaching at ITESM, work status by gender, academic unit by years of teaching at ITESM, academic unit by professional development/MET Implementation level, academic unit by educational level, and academic unit by gender (see Appendix D, Table D4: *Barrier Multivariate Tests*).

RESEARCH QUESTION 2 (RQ2)

How do individual characteristics and the extent of professional development affect present concerns of faculty regarding adoption of the ITESM Educational Model (MET)?

Hypothesis 2

It was hypothesized that present concerns of faculty at different stages of implementation of the MET could be predicted from individual differences such as work status, academic unit, years of teaching at ITESM, educational level, gender, and professional development/MET implementation level.

Data Considered

In order to test this hypothesis, concerns data was collected from participants via the 35-item Stages of Concern Questionnaire (SoCQ), as indicated in the previous chapter. Basic individual information—work status, academic unit, years of teaching at ITESM, educational level, gender, and professional development—was collected from participants via a 15-item general demographic questionnaire for the purpose of classification into categories for data analysis procedures.

Multinomial Regression Analyses

Hypothesis 2 was tested using a multinomial logistic regression in order to predict present concerns of faculty from their extent of professional development and their individual differences. Multinomial logistic regression was appropriate because it is a form of regression used when the dependent variable has more than two categories and the independent variables are continuous variables, categorical variables, or both (Garson, 2003).

HYPOTHESIS 2: FACULTY CONCERNS DATA ANALYSIS

Hypothesis 2 examined whether present concerns of faculty in different stages of implementation of the MET could be predicted from six individual characteristics such as work status, professional development/MET implementation level, academic unit, years of teaching at ITESM, educational level, and gender.

As in previous analyses, the following independent variables (IVs) were used as predictors in the multinomial logistic regression for Hypothesis 2: (1) Work Status Group, (2) Academic Unit, (3) Years of Teaching at ITESM, (4) Educational Level, (5) Gender, and (6) Professional Development/MET

Implementation Level. The fifth stage of implementation (i.e., renewing user) of the MET was used as the reference group in the logistic regression.

The dependent variables (DVs) for Hypothesis 2 were the following three categories of concerns level: (a) Self, (b) Task, or (c) Impact, as defined by Hall and Hord (2001). The Self concerns category was used as the reference group in the logistic regression.

A more detailed description of the dependent variables (DVs) and independent variables (IVs) for Hypothesis 2 is provided in Chapter 3.

Table 51 provides a summary of Faculty Concerns Data Analysis for Hypothesis 2 (RQ2).

Table 51. Summary of Faculty Concerns Data Analysis for Hypothesis 2 (RQ2)

RQ2: How do individual characteristics and the extent of professional development affect present concerns of faculty regarding adoption of the ITESM Educational Model (MET)?

Hypothesis 2. It was hypothesized that present concerns of faculty at different stages of implementation of the MET could be predicted from individual differences such as work status, academic unit, years of teaching at ITESM, educational level, gender and professional development/MET implementation level.

Statistical Analysis for Hypothesis 2: Multinomial Logistic Regression

- **Concerns Level (DVs)**
  1. Self
  2. Task
  3. Impact

  Predictors/Independent Variables (IVs)
  1. Professional Development/MET Implementation Level
     - Non-User
     - Inexperienced User
     - Experienced User
     - Experienced-Advanced User
     - Renewing User

  2. Work Status Group (Part-Time or Full-Time)
  3. Academic Unit (Engineering, Business, Liberal Arts, or High School)
  4. Educational Level (Bachelor or Master's degree, or Doctorate)
  5. Years of Teaching at ITESM (0-2, 3-5, 6-9, or 10 years or more)
  6. Gender (Male or Female)

As indicated earlier, multinomial logistic regression was appropriate because it is a form of regression used when the dependent variable has more than two categories and the independent variables are continuous variables, categorical variables, or both. Multinomial logistic regression exists to analyze dependent variables with a greater number of classes. Logistic regression applies maximum likelihood estimation after transforming the dependent into a logit variable (the natural log of the odds of the dependent occurring or not). In this way, logistic regression may be used to estimate the probability of a certain event occurring (Garson, 2003).

The statistical analysis in this multinomial regression allowed the data to reveal relationships of interest to systemic educational change at the Mexico City campus of ITESM. It was anticipated that differences in professional development/MET implementation level, work status group, academic unit, years of teaching at ITESM, educational level, and gender would affect faculty concerns regarding adoption of the ITESM Educational Model.

MULTINOMIAL LOGISTIC REGRESSION RESULTS

SPSS multinomial regression tests provided significant results indicating the correlation between the independent variables or predictors (faculty individual differences and extent of professional development) and the categorical dependent variables (concerns levels). The participants' categorical concerns levels for this research question were determined through the CBAM Stages of Concern procedure (Hall & Hord, 2001) described in Chapter 3 and illustrated in Table 4.

Significant results of the regression surfaced another **major finding** of this study: The concerns level of faculty at the Mexico City campus of ITESM can only be predicted by whether professors are full-time or part-time. In other words, faculty concerns levels are significantly related to their work status group. The rest of the variables were thus omitted from further analyses.

Table 52 provides the concerns level frequencies obtained from the study's participants in the study. There were 127 (41%) participants categorized in the *Impact* concerns level; 58 (18.7%) in the *Task* concerns level; and 125 (40.3%) in the *Self* concerns level.

Table 52. Concerns Level Frequencies of Participants

		Frequency	Percent	Valid Percent[21]	Cumulative Percent
Valid	Impact	127	38.1	41.0	41.0
	Task	58	17.4	18.7	59.7
	Self	125	37.5	40.3	100.0
	Total	310	93.1	100.0	
Missing	System	23	6.9		
Total		333	100.0		

[21] Valid percent figures in this column do not consider frequency-based cases with missing data. Figures only consider those cases of participants completing the demographic questionnaire.

Results of the multinomial logistic regression are provided in Table 53. These results indicated that work status (EMPLOYRR) was the only independent variable (IV) included in the equation that was significantly related to the concerns level dependent variable ($Chi^2 = 10.804$, df = 2, p = 0.005). None of the other independent variables (IVs) included in the logistic regression was significantly related.

Table 53. Likelihood Ratio Tests for RQ2

Effect	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Intercept	421.570(a)	0.000	0	0.000
FDPUSE5N	432.708	11.138	8	0.194
DIVISAR	428.452	6.882	6	0.332
EMPLOYRR	432.374	10.804	2	**0.005**
YRSITSR	427.050	5.480	6	0.484
EDUCRDOC	423.345	1.775	2	0.412
GENDER	424.013	2.443	4	0.655

The likelihood ratio test is a statistical test of the goodness-of-fit between two models, the unrestricted and the restricted. In our case, each reduced model is formed by omitting an effect from the general model. The null hypothesis is that all parameters of that effect are 0.

These results indicated the analysis could be reduced to a Pearson Chi-Square[22] test in order to better explore the relationship between Concerns Level and Work Status. This analysis is provided next.

Work-Status * Concerns Level Pearson Chi-Square Test

The Pearson Chi-Square test indicated a significant relationship between faculty Concerns Level in the *Self* and *Task* categories and Work Status (Pearson Chi-Square value = 10.804, df = 2, p = 0.005, n = 306). Specifically, this finding revealed that the faculty's relatively high concerns in the *Self* and *Task* categories was significantly related to whether they were full-time or part-time professors at the Mexico City campus of ITESM. In other words, faculty concerns in the *Self* and *Task* categories could be predicted by the professors' work status group. These results are shown in Table 54 where the observed count and the expected count display differences in several cells.

[22]The Pearson Chi-Square test can be used to examine the association between two variables.

Table 54. Work Status * Concern Level Cross-Tabulation

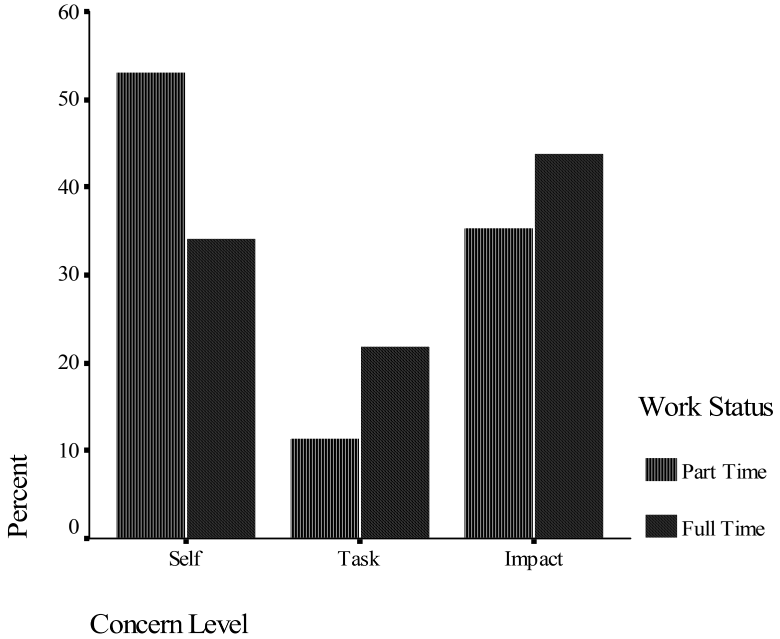
			Concern Level			
			Impact	Task	Self	Total
Work Status	Part-Time	Count	34	11	51	96
		Expected Count	39.5	17.9	38.6	96.0
		Row %	35.4	11.5	53.1	100.0
		Adjusted Residual	-1.4	**-2.2**	**3.1**	
	Full-Time	Count	92	46	72	210
		Expected Count	86.5	39.1	84.4	210.0
		Row %	43.8	21.9	34.3	100.0
		Adjusted Residual	1.4	**2.2**	**-3.1**	
Total		Count	126	57	123	306
		Expected Count	126.0	57.0	123.0	306.0
		Row %	41.2	18.6	40.2	100.0

For example, 11 part-time faculty members (11.5%) reported their relatively highest concerns level regarding the adoption of the MET as *Task*. The statistically expected count for this table cell was 17.9. The adjusted standardized residual value indicates that the standardized difference between the expected and the actual count is significant if it falls above 2.0 or below -2.0. A value of -2.2 can be observed in the Part-Time Task Concerns cell. This value is significant, indicating fewer part-time faculty than expected fell by chance into the Task Concerns category. Contrary to these figures, the adjusted standardized residual value in the Full-Time Task Concerns cell was 2.2. This value is significant, indicating more full-time faculty than expected fell by chance into the Task Concerns category.

Additionally, 51 part-time faculty members (53.1%) reported their relatively highest concerns level regarding the adoption of the MET as *Self*. The expected count for this table cell was 38.6. A value of 3.1 can be observed in the Part-Time Self Concerns cell. This value was significant, indicating more part-time faculty than expected fell by chance into the Self Concerns category. Contrary to these figures, the adjusted standardized residual value in the Full-Time Self Concerns cell was -3.1. This value was significant, indicating fewer full-time faculty than expected fell by chance into the Self Concerns category.

Figure 24 provides the relative distribution of full-time and part-time faculty within the *Self, Task*, and *Impact* Concerns categories at the Mexico City campus of ITESM.

Figure 24. Concern level and work status distribution at ITESM Mexico City



Professional Development/MET Implementation * Concern Level Pearson Chi-Square Test

The literature states that college faculty and teachers concerns are influenced by professional development. In this exploratory study, professional development constituted a key variable to be examined due to the importance of faculty professional development at ITESM. Consequently, the researcher additionally conducted a Pearson Chi-Square test in order to explore the relationship between professional development/MET implementation and faculty concerns level.

SPSS Pearson Chi-Square test results identified a significant relationship between faculty Concerns Level in the *Self* and *Impact* categories and faculty professional development/MET implementation in the non-user and advanced user categories (Pearson Chi-Square value = 15.93, df = 8, p = 0.043, n = 279).

These results indicated that the professors' relatively highest concerns level in the *Self* and *Impact* categories were significantly related to whether they were non-users or advanced users of the MET at ITESM Mexico City. In other words, faculty concerns in the Self and Impact categories could be significantly predicted by the non-user or advanced user levels of the MET implementation.

These results are shown in Table 55 where the observed count is different from the expected count in several cells.

Table 55. Professional Development/MET Implementation * Concern Level

Professional Development/MET Implementation		Relative Highest Concern Lowest of 2			Total
		Self	Task	Impact	
Non-User	Count	**20**	7	**7**	34
	Expected Count	**13.2**	6.3	**14.5**	34.0
	Adjusted Residual	**2.6**	.3	**-2.8**	
Inexperienced	Count	20	7	15	42
	Expected Count	16.3	7.8	17.9	42.0
	Adjusted Residual	1.3	-.4	-1.0	
Experienced-Advanced	Count	23	12	25	60
	Expected Count	23.2	11.2	25.6	60.0
	Adjusted Residual	-.1	.3	-.2	
Advanced	Count	**25**	20	45	90
	Expected Count	**34.8**	16.8	38.4	90.0
	Adjusted Residual	**-2.6**	1.1	1.7	
Renewing User	Count	20	6	27	53
	Expected Count	20.5	9.9	22.6	53.0
	Adjusted Residual	-.2	-1.5	1.4	
Total	Count	108	52	119	279
	Expected Count	108.0	52.0	119.0	279.0

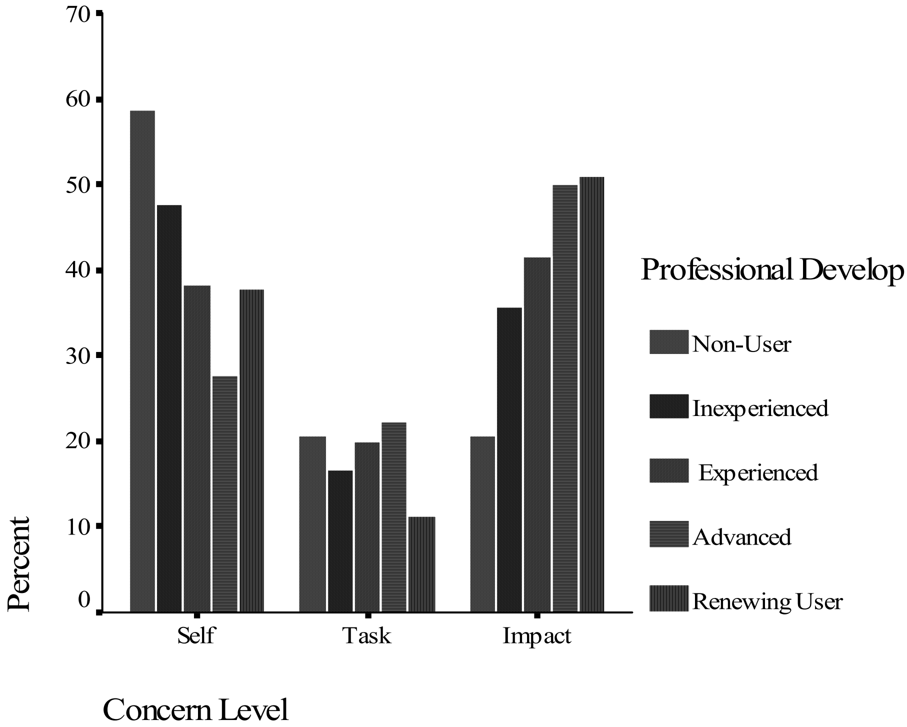
For example, 20 (58.8%) non-user professors reported their relatively highest concerns in the *Self* category. The expected count for this table cell was 13.2. The adjusted standardized residual value indicates the standardized difference between the expected and the actual count was significant if it falls above 2.0 or below -2.0. The Non-User Self cell displays a value of 2.6. This value is significant, indicating more non-users than expected fell by chance into the Self category.

On the other hand, a smaller number than expected of ITESM professors in the advanced user category fell into the *Self* Concerns category, that is, 25 advanced users (27.8%) reported their relatively highest concerns in the *Self* category. The adjusted standardized residual value was -2.6, indicating a significant value. Finally, only 7 non-user level professors reported their relatively highest concerns in the *Impact* category; less than expected (adjusted standardized residual equaled -2.8) fell into this category.

Summarizing, faculty concerns in the *Self* and *Impact* categories were significantly predicted by the non-user or experienced-advanced user levels of the MET implementation. Interestingly, faculty concerns in the *Task* category were not significantly predicted by any of the professional development/MET implementation levels, as the Task Concerns category did not account for significant differences.

Figure 25 shows the distribution of faculty Concern Levels and Professional Development/MET Implementation level at ITESM Mexico City.

Figure 25. Faculty distribution by concern level and professional development at ITESM Mexico City



A summary with significant results for faculty concerns level is provided in Table 56.

Table 56. Summary of Significant Results for RQ2: Faculty Concerns Levels

RQ2 Concerns Levels (Multinomial Regression Analysis)	
1. Work Status & Concerns Level • Full-time and Part-time in the *Self* and *Task* Categories	(p = **0.005**)
2. Prof. Dev./MET Imp. & Concerns Level • Non-users and Experienced-Advanced Users in the *Self* and *Impact* Categories	(p = **0.043**)

RESEARCH QUESTION 3 (RQ3)

What administrative leadership interventions are perceived as facilitating the implementation of the ITESM Educational Model (MET)?

Hypothesis 3

It was hypothesized that faculty will have significantly different perceptions of the administrative leadership interventions facilitating the implementation of the MET when individual characteristics are taken into consideration.

Data Considered

In order to test this hypothesis, perception data was collected from participants via a 60-item scale instrument for administrative leadership interventions, as indicated in the previous chapter. Basic individual information—work status, professional development, academic unit, years of teaching at ITESM, educational level, and gender—was collected from participants via a 15-item general demographic questionnaire for the purpose of classification into categories for data analysis procedures.

Multivariate Analysis

Hypothesis 3 was tested using a multivariate analysis of variance (MANOVA) for administrative leadership interventions. As indicated previously, MANOVA was appropriate because it enabled the researcher to compare groups formed by categorically independent variables to group differences in a set of interval dependent variables (Garson, 2003).

HYPOTHESIS 3: LEADERSHIP INTERVENTIONS ANALYSIS

Hypothesis 3 examined whether faculty at different levels of adoption had significantly different perceptions of administrative leadership interventions that facilitate the implementation of the ITESM Educational Model when their individual characteristics were taken into consideration.

Analysis for Hypothesis 3 was conducted through a 2 (Work Status Group) by 5 (Professional Development/MET Implementation Level) by 4 (Academic Unit) by 4 (Years of Teaching at ITESM) by 2 (Educational Level) by

2 (Gender) MANOVA with 6 Leadership Intervention factors scores as dependent variables (DVs).

This MANOVA analysis was performed to examine the main and interaction effects of categorical variables as predictors (i.e., independent variables) on multiple interval dependent variables. In Hypothesis 3, MANOVA was used to compare groups formed by six categorical independent variables (IVs) to group differences in a set of six interval leadership intervention dependent variables (DVs).

The six categorical independent variables in the MANOVA for Hypothesis 3 were the following: (1) Work Status Group, (2) Professional Development/MET Implementation Level, (3) Academic Unit, (4) Years of Teaching at ITESM, (5) Educational Level, and (6) Gender.

The dependent variables for Hypothesis 3 were the following six Leadership Intervention factors: (1) Supportive Change Culture, (2) Time and Resources for Professional Development, (3) Monitoring Progress, (4) Ongoing Support/Coaching, (5) Providing Resources and Arrangements, and (6) Continuous Communication.

A more detailed description of the dependent variables (DVs) and independent variables (IVs) for Hypothesis 3 is provided in Chapter 3.

Table 57 provides a summary of the Leadership Intervention Analysis for Hypothesis 3 (RQ3).

Table 57. Summary of Leadership Intervention Analysis for Hypothesis 3 (RQ3)

RQ3: What administrative leadership interventions are perceived as facilitating the implementation of the ITESM Educational Model (MET)?

Hypothesis 3. It was hypothesized that faculty will have significantly different perceptions of the administrative leadership interventions that facilitate the implementation of the MET when individual characteristics are taken into consideration.

Statistical Analysis for Hypothesis 3: Multivariate Analysis of Variance

Leadership Intervention Factors (DVs)
1. Supportive Change Culture
2. Time and Resources for Professional Development
3. Monitoring Progress
4. Ongoing Support/Coaching
5. Providing Resources and Arrangements
6. Continuous Communication

Predictors/Independent Variables (IVs)
1. Professional Development/MET Implementation Level
    - Non-User
    - Inexperienced User
    - Experienced User
    - Experienced-Advanced User
    - Renewing User

Demographics
2. Work Status Group (Part-Time or Full-Time)
3. Academic Unit (Engineering, Business, Liberal Arts, or High School)
4. Educational Level (Bachelor or Master’s degree, or Doctorate)
5. Years of Teaching at ITESM (0-2, 3-5, 6-9, or 10 years or more)
6. Gender (Male or Female)

LEADERSHIP INTERVENTIONS DATA ANALYSIS AND OBTAINED RESULTS

A MANOVA (with a Bonferroni-test adjusted α based on the number of dependent variables) was conducted to assess statistical significance of the results in order to determine how faculty perceptions of leadership interventions varied across the five implementation levels of the MET when the following individual characteristics were taken into consideration: (1) Work Status Group, (2) Professional Development/MET Implementation Level, (3) Academic Unit, (4) Years of Teaching at ITESM, (5) Educational Level, and (6) Gender.

Leadership Intervention Factors Mean Responses

As indicated in the previous chapter, six composite scores were calculated from the participants averaged responses to the six facilitating administrative leadership intervention types which became the 6 dependent variables. SPSS descriptive statistics provided the participants perception mean responses and standard deviations for the six dependent Leadership Intervention factors. Table 58 provides the faculty perception mean responses for each dependent Leadership Intervention factor, ranked from the highest to the lowest values. Perception mean responses within the 4-5 range were high values, whereas perception mean responses within the 0-1 range were low values. Perception mean responses within the 3 range were moderate. As shown in this table faculty perception mean responses[23] were as follows for each dependent Leadership Intervention factor: (1) Supportive Change Culture: 2.8366, (2) Time and Resources for Professional Development: 2.5632, (3) Monitoring Progress: 1.9518, (4) Ongoing Support: 2.2708, (5) Providing Resources and Arrangements: 3.2480, and (6) Continuous Communication: 2.2448.

These results indicated the relative importance of the Leadership Intervention factors as perceived by the faculty. Professors at the Mexico City campus perceived Providing Resources and Arrangements—Information Technology infrastructure and related support are in place—as the highest Leadership Intervention factor (mean value = 3.248) facilitating the implementation of the MET and Monitoring Progress—data collection and analyses to assess the effects of the ITESM Educational Model—as the lowest Leadership Intervention factor facilitating the implementation of the MET (mean value = 1.951). Interestingly, leadership intervention factors 2-6 received relatively low ranks (see Appendix D, Table D5: *Leadership Intervention Descriptive Statistics*).

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23 Faculty perceptions of the administrative Leadership Intervention factors were collected via a Likert-type scale instrument containing 60 close-ended questions with a six point scale ranging from: 0) Action not evident to me, 1) Strongly Disagree, 2) Disagree, 3) Undecided, 4) Agree, 5) Strongly Agree.

Table 58. Faculty Perception Mean Responses for Leadership Intervention Factors

Leadership Intervention Factors (Name)	Leadership Intervention Factors (Description)	Perceptions (Mean Responses)
1. Providing Resources and Arrangements	Information Technology infrastructure and related support are in place.	3.2480
2. Supportive Change Culture	ITESM culture of collaboration and educational innovation.	2.8366
3. Time and Resources for Professional Development	Time devoted to work on the acceptance of new faculty roles and new technologies. Allocation of economic resources to reward professional development.	2.5632
4. Ongoing Support/Coaching	Academic administrators encourage faculty to constantly improve the MET implementation through a positive educational environment.	2.2708
5. Continuous Communication	Academic administrators communicate with individual faculty and with small and large groups of faculty.	2.2448
6. Monitoring Progress	Data collection and analyses to assess the effects of the ITESM Educational Model.	1.9518

Faculty Perceptions of Leadership Interventions

The MANOVA analysis for Hypothesis 3 was performed to examine the main effects and the interaction effects of categorical variables as predictors (i.e., independent variables) on multiple interval dependent variables. SPSS multivariate tests indicated significant results of faculty perceptions relating to Leadership Intervention factors when individual characteristics were taken into consideration. Statistically significant results and marginally significant results were obtained from faculty individual characteristics' main effects and interaction effects related to the six Leadership Intervention factors. Although marginally significant results are not as important as significant ones, they were provided due to the exploratory nature of the study.

Following are the **major findings** in this area.

1. Faculty at the Mexico City campus of ITESM had significantly different perceptions of administrative leadership interventions when their work status (full-time vs. part-time) was taken into consideration relative to the following Leadership Intervention factors: (a) Providing Resources and Arrangements, and (b) Supportive Change Culture.

2. Faculty at the Mexico City campus of ITESM had significantly different perceptions of administrative leadership interventions when their years of teaching at ITESM (0-2, 3-5, 6-9, or 10 years or more) and educational level (bachelor or master's degree vs. doctorate) were taken into consideration relative to the following Leadership Intervention factors: (a) Ongoing Support/Coaching, and (b) Providing Resources and Arrangements.

Marginally significant results were as follows:

3. Faculty at the Mexico City campus of ITESM had marginally significant different perceptions of administrative leadership interventions when their professional development/MET implementation level (non-user, inexperienced user, experienced user, experienced-advanced user, or renewing user) and academic unit (Engineering, Business, Liberal Arts, or High School) were taken into consideration relative to the following Leadership Intervention factor: (a) Providing Resources and Arrangements.

4. Faculty at the Mexico City campus of ITESM had marginally significant different perceptions of administrative leadership

> interventions when their professional development/MET implementation level (non-user, inexperienced user, experienced user, experienced-advanced user, or renewing user) and educational level (Bachelor or Master vs. Doctorate) were taken into consideration relative to the following Leadership Intervention factors: (a) Supportive Change Culture, and (b) Ongoing Support/Coaching.

For further reference, see Appendix D, Table D6: *Leadership Intervention Multivariate Tests.* Detailed analyses of significant results and marginally significant results are provided next.

Analysis of Significant Results

Detailed analysis of significant results related to the two **major findings** are addressed next.

Significance of Work Status

SPSS multivariate tests provided significant results for faculty perceptions relating to Leadership Intervention factors when work status was taken into consideration. For faculty with different work status there was a significant main effect (Wilk's Lambda = 0.914, F = 2.233, df = 6, 142, p = 0.043) relative to the perception of the following Leadership Intervention factors: (a) Providing Resources and Arrangements, and (b) Supportive Change Culture.

As shown in Table 59, the relationship between faculty work status was important due to significant differences between the groups in the following

Leadership Intervention factors: (a) providing resources and arrangements (F = 9.706, df = 1, 147, p = 0.002) and (b) supportive change culture (F = 3.991, df = 1, 147, p = 0.048).

Table 59. Leadership Intervention Tests of Between-Subjects Effects: Work Status

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Work Status EMPLOYRR	Time and Resources for Professional Development	0.329	1	0.329	0.272	0.603
	Monitoring Progress	0.183	1	0.183	0.184	0.669
	Ongoing Coaching	0.005	1	0.005	0.007	0.934
	Providing Resources and Arrangements	8.032	1	8.032	9.706	**0.002**
	Supportive Change Culture	3.845	1	3.845	3.991	**0.048**
	Continuous Communication	0.296	1	0.296	0.286	0.594

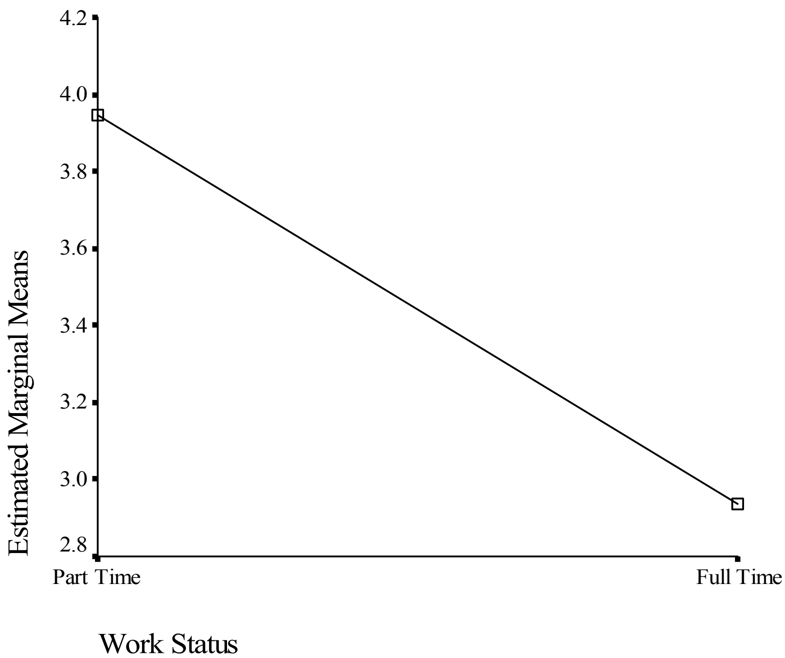
The relationship between the faculty work status and each one of these Leadership Intervention factors will be examined next.

Providing Resources and Arrangements

Significant differences between the mean values of part-time faculty (M = 3.948 ± 0.319) and full-time faculty (M = 2.934 ± 0.192) are shown in Figure 26. These results illustrate the perception of faculty regarding the administrative leadership intervention facilitation effect of Providing Resources and Arrangements. **Note**: M (Mean) values are reported ± SE (standard error).

Results surfaced that part-time faculty at the Mexico City campus had a higher perception of the facilitation effect of *Providing Resources and Arrangements*—Information Technology infrastructure and related support are in place—than full-time faculty.

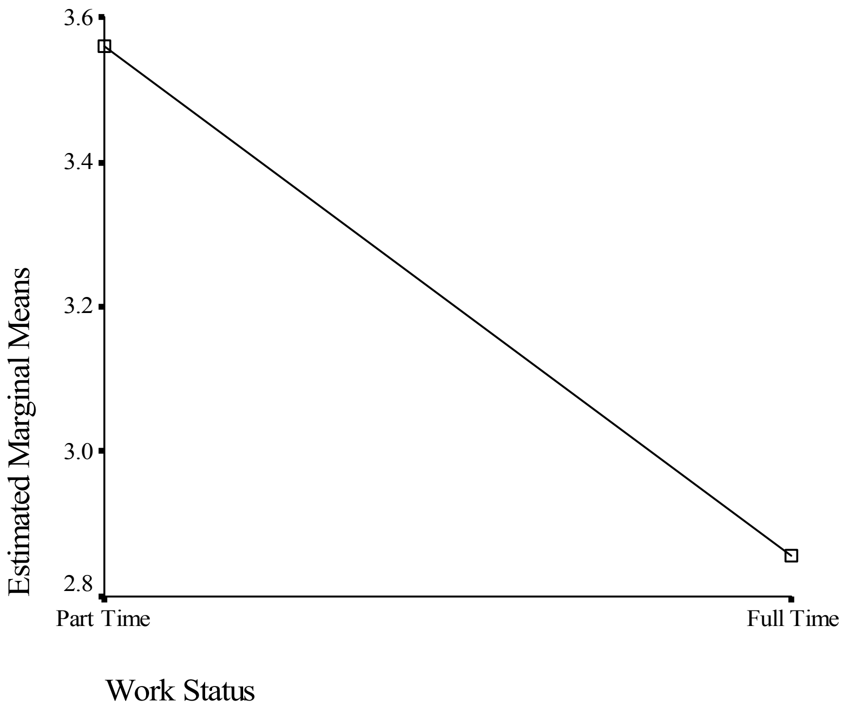
Figure 26. Estimated marginal means of providing resources and arrangements



Supportive Change Culture

Significant differences between the mean values of part-time faculty (M = 3.559 ± 0.319) and full-time faculty (M = 2.857 ± 0.207) are shown in Figure 27. These results illustrate the perception of faculty regarding the administrative leadership intervention facilitation effect of *Supportive Change Culture*. Part-time faculty at the Mexico City campus had a higher perception of the facilitation effect of the *Supportive Change Culture*—ITESM culture of collaboration and educational innovation—than full-time faculty.

Figure 27. Estimated marginal means of supportive change culture



Significance of Educational Level by Years of Teaching at ITESM

For faculty at different levels of Professional Development/MET Implementation, there was a significant interaction effect (Wilk's Lambda = 0.780, F = 2.056, df = 18, 402, p = 0.007) between their educational level (bachelor or master's degree vs. doctorate) and years of teaching at ITESM (0-2, 3-5, 6-9, or 10 or more years) relative to the perception of the following Leadership Intervention factors: (a) Ongoing Coaching and (b) Providing Resources and Arrangements.

As shown in Table 60, the relationship between faculty's educational level and years of teaching at ITESM was important due to significant differences between the groups in the factor (a) Ongoing Coaching (F = 2.934, df = 3, 165, p = 0.035) and marginally significant in the factor (b) Providing Resources and Arrangements (F = 2.541, df = 3, 165, p = 0.059).

Table 60. Leadership Intervention Tests of Between-Subjects Effects: Educational Level by Years of Teaching at ITESM

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Years of teaching* Educational level	Time and Resources for Professional Development	1.621	3	0.540	0.446	0.721
(YRSITRR * EDUCRDOC)	Monitoring Progress	3.813	3	1.271	1.276	0.285
	Ongoing Support/Coaching	6.400	3	2.133	2.934	**0.035**
	Providing Resources and Arrangements	6.309	3	2.103	2.541	**0.059**
	Supportive Change Culture	3.481	3	1.160	1.204	0.310
	Continuous Communication	0.379	3	0.126	0.122	0.947

Post Hoc tests were conducted for the Leadership Intervention factors Ongoing Coaching and Providing Resources and Arrangements to obtain more detailed results that facilitated deeper levels of analysis. These analyses are addressed next.

Ongoing Coaching

Pairwise Comparison Post Hoc tests were conducted for the factor *Ongoing Coaching* to examine how the estimated mean values for educational level by years of teaching at ITESM groups varied. The results shown in Table 61 indicated that there was a marginally significant difference between the mean values of faculty with Bachelor´s or Master's degrees with 10 or more years of teaching at ITESM (M = 1.926 ± 0.279) and faculty with doctorates with 10 or more years of teaching at ITESM

(M = 2.605 ± 0.368).

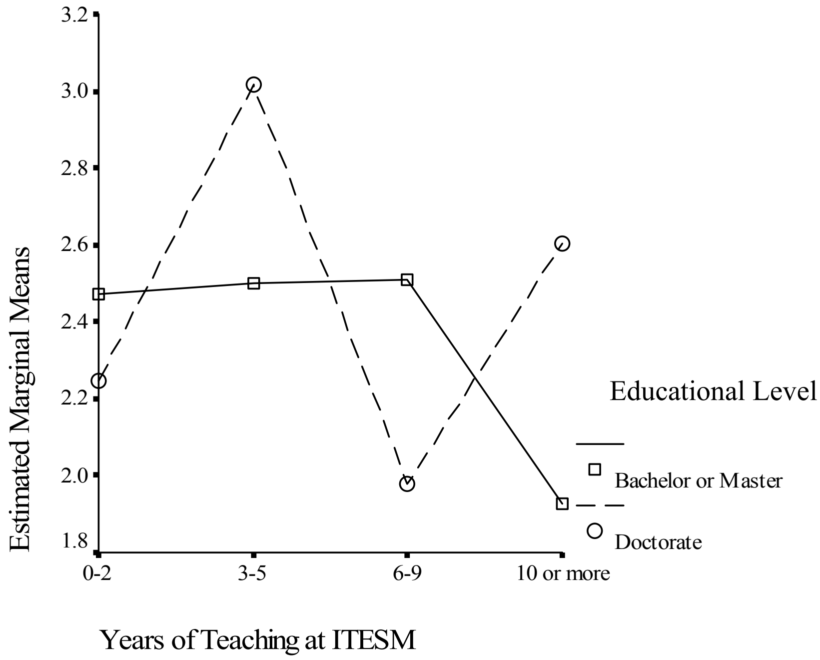
Table 61. Ongoing Coaching Pairwise Comparisons

Dependent Variable	Years of Teaching at ITESM	Educational Level (I)	Educational Level (J)	Mean Difference (I-J)	Std. Error	Sig. (a)
Ongoing Support/ Coaching	0-2	Bachelor or Master	Doctorate	0.225	0.501	0.654
	3-5	Bachelor or Master	Doctorate	-0.517	0.390	0.187
	6-9	Bachelor or Master	Doctorate	0.531	0.438	0.227
	10 or more	**Bachelor or Master**	**Doctorate**	**-0.679**	**0.373**	**0.071**

Based on estimated marginal means
* The mean difference is significant at the 0.05 level.

Differences between the mean values of faculty with a Bachelor or Master's degree or a Doctorate with varying numbers of years teaching at ITESM are illustrated in Figure 28. Marginally significant differences surfaced that professors with a doctorate with 10 or more years of teaching at ITESM perceived *Ongoing Support/Coaching*—academic administrators encourage faculty to constantly improve the MET implementation through a positive educational environment—as a higher facilitating leadership intervention factor to implement the MET than professors with a Bachelor or a Master's degree with 10 or more years of teaching at the institution.

Figure 28. Estimated marginal means of ongoing support/coaching



Providing Resources and Arrangements

Pairwise Comparison Post Hoc tests were conducted for the factor *Providing Resources and Arrangements* to examine how the estimated mean values for educational level by years of teaching at ITESM groups varied. The results shown in Table 62 indicated that there was a significant difference between the mean values of faculty with a Bachelor or a Master's degree with 10 or more years of teaching at ITESM (M = 2.684 ± 0.298) and faculty with a doctorate with 10 or more years of teaching at ITESM (M = 3.738 ± 0.392).

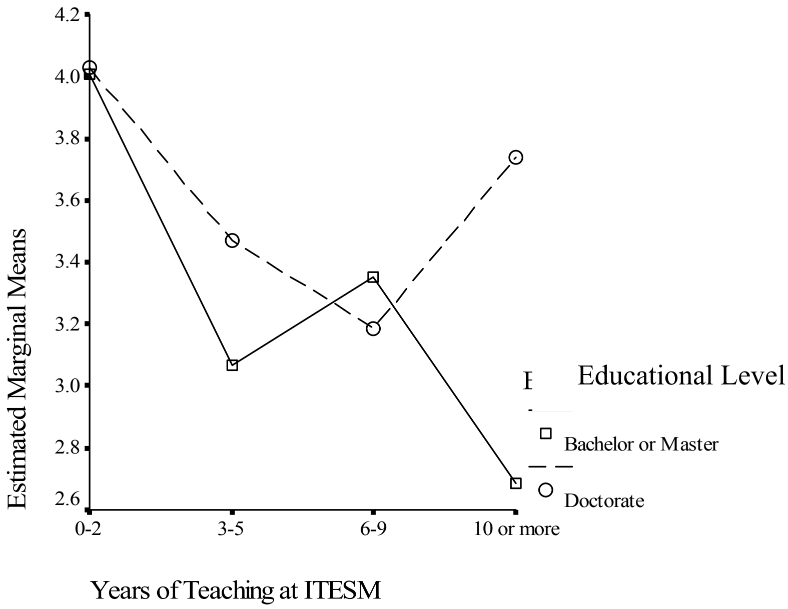
Table 62. Providing Resources and Arrangements Pairwise Comparisons

Dependent Variable	Years of Teaching at ITESM	Educational Level (I)	Educational Level (J)	Mean Difference (I-J)	Std. Error	Sig. (a)
Providing Resources and Arrangements	0-2	Bachelor or Master	Doctorate	-0.018	0.535	0.974
	3-5	Bachelor or Master	Doctorate	-0.406	0.416	0.330
	6-9	Bachelor or Master	Doctorate	0.163	0.468	0.729
	10 or more	**Bachelor or Master**	**Doctorate**	**-1.054 ***	**0.398**	**0.009**

Based on estimated marginal means
* The mean difference is significant at the 0.05 level

Differences between the mean values of faculty with a Bachelor or Master's degree or a Doctorate with different years of teaching at ITESM are illustrated in Figure 29. Professors with doctorate with 10 or more years of teaching at ITESM perceived *Providing Resources and* Arrangements—Information Technology infrastructure and related support are in place—as a greater facilitating leadership intervention factor to implementing the MET than professors with Bachelor or Master's degree with 10 or more years of teaching at ITESM.

Figure 29. Estimated marginal means of providing resources and arrangements



Analysis of Marginally Significant Results

Detailed analyses of marginally significant results related to the two lesser findings are addressed next.

Marginal Significance of Academic Unit by Professional Development/MET Implementation Level

For faculty at different levels of implementation of the MET there was a marginally significant interaction effect (Wilk's Lambda = 0.541 , F = 1.292, df = 72, 778, p = 0.058) between faculty academic unit (Engineering, Business, Liberal Arts, or High School) and professional development/MET implementation level (non-user, inexperienced user, experienced user, advanced user or renewing user) relative to the perception of the following Leadership Intervention factor: (a) Providing Resources and Arrangements.

As shown in Table 63, the relationship between faculty academic unit and professional development/MET implementation level was important due to significant differences between the groups in the factor: (a) Providing Resources and Arrangements (F = 1.887, df = 12, 165, p = 0.040).

Table 63. Leadership Intervention Tests of Between-Subjects Effects: Academic Unit by Professional Development/MET Implementation Level

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Academic Unit* Professional Development (DIVISAR * FDPUSE5N)	Time and Resources for Professional Development	14.183	12	1.182	0.975	0.475
	Monitoring Progress	17.493	12	1.458	1.464	0.144
	Ongoing Coaching	10.914	12	0.910	1.251	0.254
	Providing Resources and Arrangements	18.744	12	1.562	1.887	**0.040**
	Supportive Change Culture	16.290	12	1.357	1.409	0.168
	Continuous Communication	17.433	12	1.453	1.405	0.170

Post Hoc tests were conducted for the factor Providing Resources and Arrangements to obtain more detailed results that facilitated deeper levels of analysis. This analysis is provided next.

Providing Resources and Arrangements

Pairwise Comparison Post Hoc tests were conducted for the factor *Providing Resources and Arrangements* to examine how the estimated mean values for Academic Unit varied across Professional Development/MET Implementation groups. The results shown in Table 62 indicated there was a significant difference between non user faculty from the Liberal Arts School ($M = 1.539 \pm 0.710$) and two other levels of professional development/MET implementation in the same academic unit: (1) the experienced user ($M = 4.785 \pm 0.574$), and (2) the advanced user ($M = 4.835 \pm 0.741$) groups.

Table 64 also indicated marginally significant differences between inexperienced user faculty from the Liberal Arts School ($M = 2.353 \pm 0.482$) and experienced user faculty from the same academic unit ($M = 4.785 \pm 0.574$).

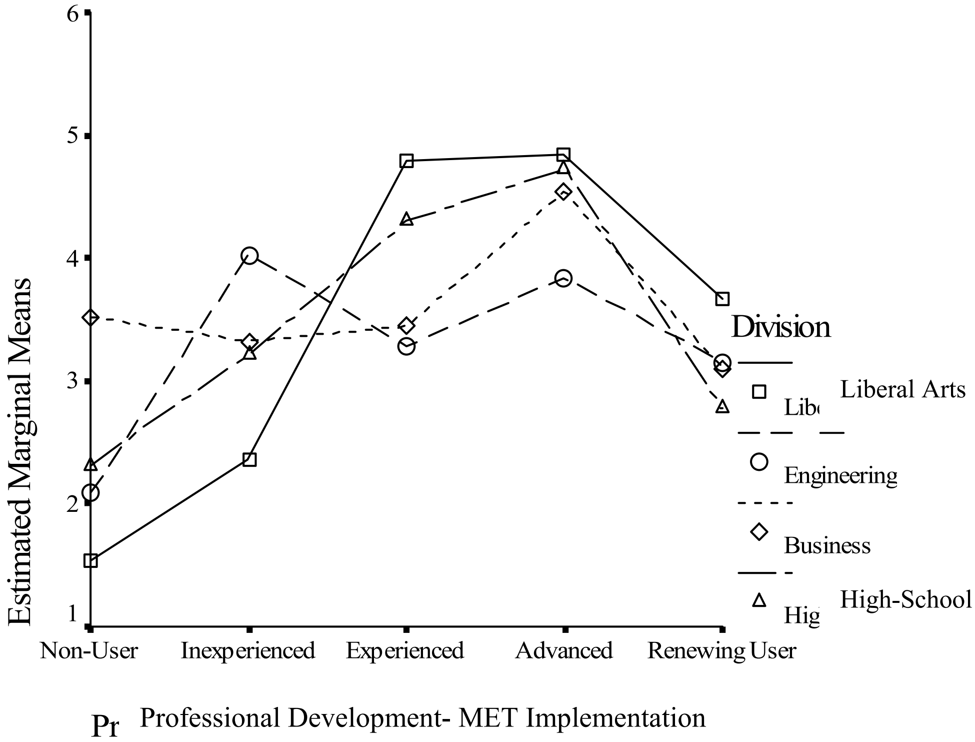
Table 64. Providing Resources and Arrangements Pairwise Comparisons

Dependent Variable	Acad. Unit (Division)	Prof. Dev./MET Implementation (I)	Prof. Dev./MET Implementation (I)	Mean Diff. (I-J)	Std. Error	Sig. (a)
Providing Resources & Arrangements	**Liberal Arts**	**Non-User**	Inexperienced	-0.814	0.810	1.000
			Experienced	-3.245 *	0.963	**0.010**
			Advanced	-3.296 *	1.050	**0.021**
			Renewing User	-2.124	0.913	0.213
		Inexperienced	Non-User	0.814	0.810	1.000
			Experienced	-2.432	0.869	**0.058**
			Advanced	-2.482	0.986	0.129
			Renewing User	-1.311	0.806	1.000
		Experienced	**Non-User**	3.245 *	0.963	**0.010**
			Inexperienced	2.432	0.869	**0.058**
			Advanced	-0.051	0.723	1.000
			Renewing User	1.121	0.682	1.000
		Advanced	**Non-User**	3.296 *	1.050	**0.021**
			Inexperienced	2.482	0.986	0.129
			Experienced	0.051	0.723	1.000
			Renewing User	1.172	0.801	1.000
		Renewing User	Non-User	2.124	0.913	0.213
			Inexperienced	1.311	0.806	1.000
			Experienced	-1.121	0.682	1.000
			Advanced	-1.172	0.801	1.000

Based on estimated marginal means
* The mean difference is significant at the 0.05 level.

Differences between the mean values of faculty groups that have achieved different levels of MET implementation from all academic units/schools are shown in Figure 30. Significant differences surfaced that advanced and experienced users from the Liberal Arts School at the Mexico City campus perceived *Providing Resources and Arrangements*—Information Technology infrastructure and related support are in place—as a higher facilitating Leadership Intervention factor than non user professors from the same academic unit.

Figure 30. Estimated marginal means of providing resources and arrangements



Marginal Significance of Professional Development/MET Implementation by Educational Level

As in previous cases, SPSS multivariate tests provided marginally significant results for faculty perceptions relating to Leadership Intervention factors when individual characteristics were taken into consideration.

Specifically, for faculty at different levels of implementation of the MET there was a marginally significant interaction effect (Wilk's Lambda = 0.785 , F = 1.410, df = 24, 497, p = 0.095) between educational level (bachelor's or master's degree or doctorate) and professional development/MET implementation (non-user, inexperienced user, experienced user, advanced user, or renewing user) relative to the perception of the following Leadership Intervention factors: (a) Supportive Change Culture, and (b) Ongoing Support/Coaching.

As shown in Table 65, the relationship between faculty educational level and professional development/MET implementation was important due to significant or marginally significant differences between the groups in the following factors: (a) Supportive Change Culture (F = 3.526, df = 4, 156, p = 0.009), and (b) Ongoing Support/Coaching (F = 2.239, df = 4, 156, p = 0.068).

Table 65. Leadership Intervention Tests of Between-Subjects Effects: Professional Development/MET Implementation by Educational Level

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Professional Dev.* Educ. Level	Time and Resources for Professional Development	6.945	4	1.736	1.433	0.226
(FDPUSE5N * EDUCRDOC)	Monitoring Progress	2.542	4	0.635	0.638	0.636
	Ongoing Coaching	**6.512**	**4**	**1.628**	**2.239**	**0.068**
	Providing Resources and Arrangements	1.504	4	0.376	0.454	0.769
	Supportive Change Culture	**13.589**	**4**	**3.397**	**3.526**	**0.009**
	Continuous Communication	2.870	4	0.717	0.694	0.598

Post Hoc tests were conducted for the factors Supportive Change Culture and Ongoing Support/Coaching to obtain more detailed results that facilitated deeper levels of analysis. These analyses are addressed next.

Supportive Change Culture

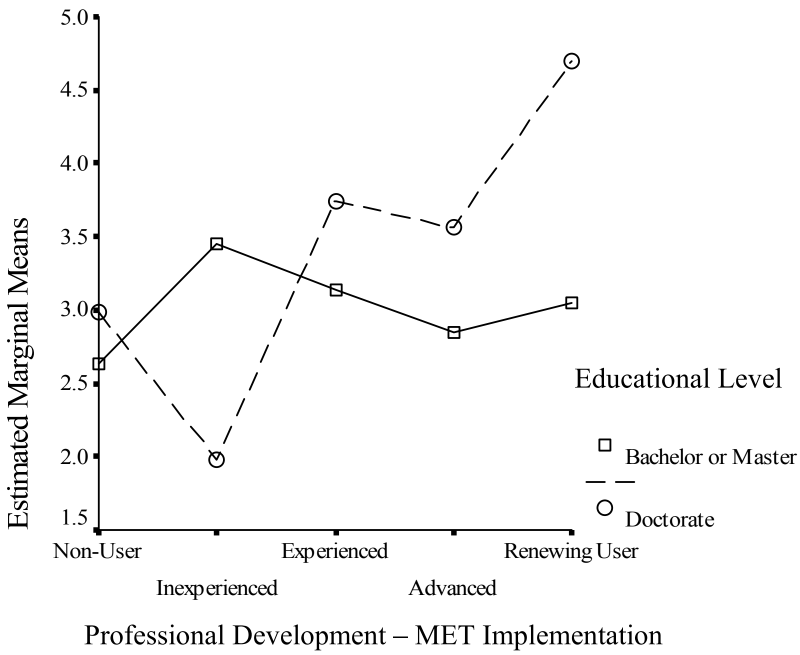
Pairwise Comparison Post Hoc tests were conducted for the factor *Supportive Change Culture* to examine how the estimated mean values for educational level varied across professional development/MET implementation groups. The results shown in Table 66 indicate that there was a significant difference between the mean values of inexperienced faculty with a Bachelor or Master's degree (M = 3.452 ± 0.364) and inexperienced faculty with a Doctorate (M = 1.984 ± 0.445). This table also indicates that there was a significant difference between the mean values of renewing faculty with a Bachelor´s or Master's degree (M = 3.044 ± 0.442) and renewing faculty with a Doctorate (M = 4.696 ± 0.587).

Table 66. Supportive Change Culture Pairwise Comparisons

Dependent Variable	Prof. Dev./ MET Imp.	Educational Level (I)	Educational Level (J)	Mean Difference (I-J)	Std. Error	Sig. (a)
Supportive Change Culture	Non-User	Bachelor or Master	Doctorate	-0.356	1.114	0.750
	Inexperienced	**Bachelor or Master**	**Doctorate**	**1.468 ***	**0.576**	**0.012**
	Experienced	Bachelor or Master	Doctorate	-0.615	0.533	0.250
	Advanced	Bachelor or Master	Doctorate	-0.714	0.465	0.127
	Renewing User	**Bachelor or Master**	**Doctorate**	**-1.652 ***	**0.563**	**0.004**

Differences between the mean values of professors that had achieved different levels of MET implementation whether with a Bachelor or Master's degree or with a Doctorate are illustrated in Figure 31. Inexperienced professors with Bachelor or Master perceived *Supportive Change* Culture—ITESM culture of collaboration and educational innovation—as a higher Leadership Intervention factor facilitating the implementation of the MET than inexperienced professors with Doctorates. Also, renewing faculty with Doctorates perceived *Supportive Change Culture* as a higher Leadership Intervention factor facilitating the implementation of the MET than renewing faculty with Bachelor's or Master's degree.

Figure 31. Estimated marginal means of supportive change culture



Ongoing Support/Coaching

Pairwise Comparison Post Hoc tests were conducted for the factor *Ongoing Support/Coaching* to examine how the estimated mean values for educational level varied across professional development/MET implementation level groups. The results shown in Table 67 indicated that there was a significant difference between the mean values of inexperienced professors with Bachelor´s or Master's degrees (M = 2.375 ± 0.316) and inexperienced professors with a Doctorate (M = 1.225± 0.386).

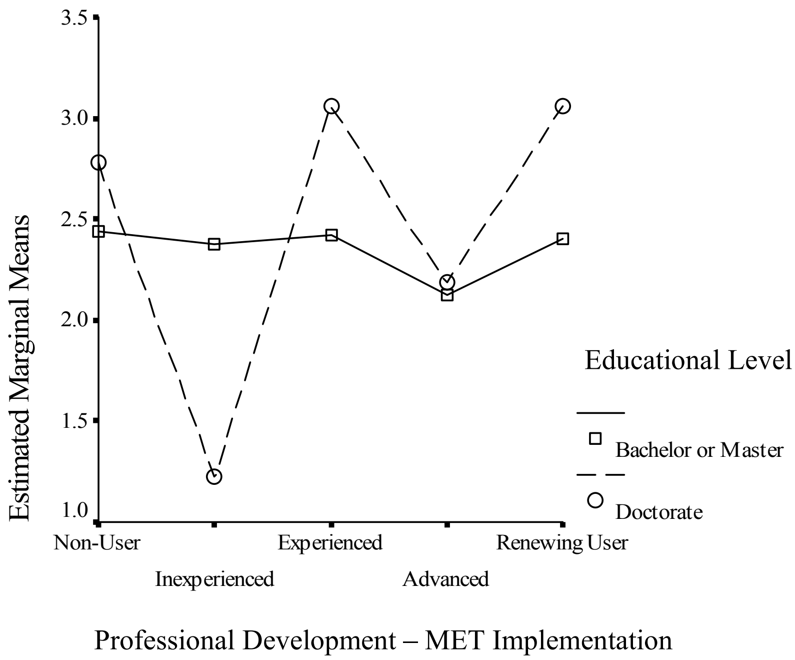
Table 67. Ongoing Support/Coaching Pairwise Comparisons

Dependent Variable	Prof. Dev./ MET Imp.	Educational Level (I)	Educational Level (J)	Mean Difference (I-J)	Std. Error	Sig. (a)
Ongoing Support/ Coaching	Non-User	Bachelor or Master	Doctorate	-0.356	1.114	0.750
	Inexperienced	**Bachelor or Master**	**Doctorate**	-0.342	0.968	0.724
	Experienced	Bachelor or Master	Doctorate	**1.150 ***	**0.501**	**0.023**
	Advanced	Bachelor or Master	Doctorate	-0.640	0.463	0.169
	Renewing User	**Bachelor or Master**	**Doctorate**	-0.058	0.404	0.885

Based on estimated marginal means
* The mean difference is significant at the 0.05 level.

Differences between the mean values of professors with Bachelor's or Master's degrees that have achieved different levels of MET implementation and professors with a Doctorate that have achieved different levels of MET implementation are illustrated in Figure 32. Significant differences surfaced that inexperienced professors with Bachelor's or Master's degrees at the Mexico City campus perceived *Ongoing Support/*Coaching—academic administrators encouraged faculty to constantly improve the MET implementation through a positive educational environment—as a higher Leadership Interventions factor facilitating the implementation of the MET than inexperienced professors with Doctorates.

Figure 32. Estimated Marginal Means of Ongoing Support/Coaching



A summary of significant results (main effects and interaction effects) for RQ3: Leadership Intervention Perceptions is provided in Table 68.

Table 68. Summary of Significant Results for RQ3: Leadership Intervention Perceptions

RQ3 Leadership Intervention Perceptions (MANOVA Analysis)	
0. Work Status (Main Effect)	**(p = 0.043)**
• Providing Resources & Arrangements	(p = 0.002)
• Supportive Change Culture	(p = 0.048)
1. Years of Teaching by Educational Level	**(p = 0.007)**
• Ongoing Support/Coaching	(p = 0.035)
• Providing Resources & Arrangements	(p = 0.059)
2. Academic Unit by Prof. Dev/MET Imp.	**(p = 0.058)**
• Providing Resources & Arrangements	(p = 0.040)
3. Prof. Dev/MET Imp by Educ. Level	**(p = 0.095)**
• Supportive Change Culture	(p = 0.009)
• Ongoing Support/Coaching	(p = 0.068)

Non-significant Main Effects and Interaction Effects

SPSS multivariate tests provided non-significant results of faculty perceptions relating to Leadership Intervention factors when faculty individual characteristics were taken into consideration. Statistically non-significant results were obtained from faculty individual characteristics' main effects and interaction effects relating to six Leadership Intervention factors.

The following independent variables (IV) did not achieve significant main effects in the MANOVA analysis for Hypothesis 3: academic unit, years of teaching at ITESM, professional development/MET implementation, educational level, and gender.

Similarly, the following independent variables (IVs) interactions did not achieve significance in the MANOVA analysis for Hypothesis 3: work status by academic unit, work status by years of teaching at ITESM, work status by professional development/MET implementation, work status by educational level, work status by gender, academic unit by years of teaching at ITESM, academic unit by educational level, academic unit by gender, years of teaching at ITESM by professional development/MET implementation, years of teaching at ITESM by gender, gender by professional development/MET implementation, and gender by educational level (see Appendix D, Table D6: *Leadership Intervention Multivariate Tests*).

OUTLIERS ANALYSIS

In the three MANOVA analyses—for Facilitators, Barriers, and Leadership Interventions respectively – two outliers were discovered. Outliers are cases having data values that are very different from the values for the majority of cases in the data set. Outliers are important because they can change the results of a data analysis. Univariate outliers are cases that have an unusual value for a single variable. Multivariate outliers are cases that have an unusual combination of values for a number of variables. The detection of outliers in one of the dependent variables—the *Top-Down Leadership Barrier* factor—(two cases of 333 cases, a 0.6% of the total sample) met the criteria to be characterized as univariate outliers.

A case is an outlier if its standardized residual is ± 3.0. The mean of the *Top-Down Leadership Barrier* factor was 3.74 (SD 0.92). In case number 1166 and case 1222 the factor score for *Top-Down Leadership* was 1.00 and the Z residual for case 1166 was -3.24163. In case number 1222 the Z residual was -3.16343.

A study was conducted to examine multivariate outliers for each of the dependant variables together with the six independent variables. The statistic used to determine the presence of multivariate outliers was Mahalanobis D^2 which is a multidimensional version of a z-score. It measures the distance of a case from the centroid (multidimensional mean) of a distribution, given the covariance (multidimensional variance) of the distribution. D^2 follows a chi-square distribution with degrees of freedom equal to the number of variables included in the calculation.

The D^2 study found that case 1166 had a Mahalanobis D^2 value of 2.79498 with a $p = 0.83410$ and case 1222 had a Mahalanobis D^2 value of 8.07309 with a $p = 0.23280$. A case is a multivariate outlier if the probability associated with its

D^2 is 0.001 or less. Therefore, although 2 cases had a Z residual above 2, there are no multivariate outliers to be removed from the data set.

SUMMARY

The main purpose of the study was to analyze and examine faculty concerns and perceptions of facilitators, barriers and leadership interventions in implementing a mandated educational change in the teaching-learning process—the ITESM Educational Model (MET)—in the Mexico City campus of ITESM. The study was guided by three research questions. It relied largely on quantitative-based methods in addition to comprehensive secondary analyses of institutional qualitative data. The research questions were assessed through statistical analysis including multivariate analysis of variance (MANOVA), multinomial logistic regression, and factor analysis (FA) with the support of the Statistical Package for the Social Sciences (SPSS). Probability (p) values of 0.05 or less were employed for significant results. Due to the exploratory nature of the study, probability values between 0.05 and 0.1 were employed for marginally/moderately significant results.

The data were collected from a sample of 333 full-time and part-time professors (34% of the total faculty population) associated with four academic units (Engineering, Business Administration, Liberal Arts, and the High School), who voluntarily responded to a Web-based survey form containing various multiple choice instruments. Data analysis, obtained results and main findings were addressed independently for each Research Question (RQ). A brief summary is provided next.

Research Question 1 (RQ1)

What are faculty perceptions of facilitators and barriers to the implementation of the ITESM Educational Model (MET)?

Hypothesis 1

Hypothesis 1 was separated into two sub-hypotheses.

Hypothesis 1a. It was hypothesized that faculty at different levels of adoption (non-user, inexperienced user, experienced user, advanced user, or renewing user) will have significantly different perceptions of the **Facilitators** to the implementation of the MET when individual characteristics (work status, professional development/MET implementation, years of teaching at ITESM, academic unit, educational level, and gender) are taken into consideration.

Hypothesis 1b. It was hypothesized that faculty at different levels of adoption (non user, inexperienced user, experienced user, advanced user, or renewing user) will have significantly different perceptions of the **Barriers** to the implementation of the MET when individual characteristics (work status, professional development/MET implementation, years of teaching at ITESM, academic unit, educational level, and gender) are taken into consideration.

Hypothesis 1 was tested using two separate multivariate analysis of variance (MANOVA) analyses: Hypothesis 1a for Facilitators and Hypothesis 1b for Barriers.

Facilitator Factors Results

Professors at the Mexico City campus of ITESM perceived the Institutional Change Culture—ITESM philosophy and values-based culture promoting innovation, change, and entrepreneurial spirit—as the highest-valued Facilitator factor (mean value = 3.82) to the implementation of the ITESM Educational Model, and the Professional Learning Community (i.e., collegiate work in ITESM system-wide academies and local academic departments supported by appropriate organizational structure of the institution) as the lowest-valued Facilitator factor (mean value = 3.02).

Major findings:

1. Faculty had significantly different perceptions of Facilitators when their work status (full-time vs. part-time) and educational level (bachelor or master's degree vs. doctorate) were taken into consideration relative to the following Facilitator factors: (a) Faculty Academic Background, (b) Institutional Change Culture, and (c) Students Acceptance of Change.

2. Faculty had significantly different perceptions of Facilitators when their professional development/MET implementation

level (non-user, inexperienced user, experienced user, experienced-advanced user, or renewing user) was taken into consideration relative to the following Facilitator factors: (a) Ongoing Support and Training, (b) Institutional Change Culture, (c) Adoption/Adaptation of Courses, and (d) Faculty Academic Background.

Marginally significant findings:

3. Faculty had marginally significant different perceptions of Facilitators when their work status (full-time vs. part-time) and professional development/MET implementation level (non-user, inexperienced user, experienced user, experienced-advanced user, or renewing user) were taken into consideration relative to the following Facilitator factors: (a) Ongoing Support and Training, (b) Institutional Change Culture, and (c) Students Acceptance of Change.

4. Faculty at the Mexico City campus of ITESM had marginally significant different perceptions of Facilitators when their years of teaching at the institution (0-2, 3-5, 6-9, or 10 or more years) and educational level (bachelor or master's degree vs. doctorate) were taken into consideration relative to the following Facilitator factors: (a) Students Acceptance of Change, (b) Professional Learning Community, (c) Adoption/Adaptation of Courses, and (d) Ongoing Support and Training.

5. Faculty had marginally significant different perceptions of Facilitators when their academic unit (engineering, business, liberal arts, or high-school) and years of teaching at ITESM (0-2, 3-5, 6-9, or 10 or more years) were taken into consideration relative to the following Facilitator factors: (a) Professional Learning Community, and (b) Students Acceptance of Change.

Barrier Factors Results

Professors at the Mexico City campus of ITESM perceived Top-down Leadership (i.e., the ITESM centralized decision-making process promoting upper level decisions) as the greatest Barrier (mean value = 3.74) to implementing the MET, and Faculty Issues (i.e., change resistance to new educational paradigms and to new faculty roles; faculty scepticism about the effectiveness of the MET; and required use of didactic methods in redesigned courses) as the lowest Barrier (mean value = 2.85).

Major finding:

> Faculty had significantly different perceptions of Barriers when their work status (full-time vs. part-time) and professional development/MET implementation level (non-user, inexperienced user, experienced user, experienced-advanced user, or renewing user) were taken into consideration relative to the following Barrier factors: (a) Support Shortcomings, (b) Infrastructure Operational Problems, and (c) Administrative Alignment and Support.

Research Question 2 (RQ2)

How do individual characteristics and the extent of professional development affect present concerns of faculty regarding adoption of the ITESM Educational Model (MET)?

Hypothesis 2

It was hypothesized that present concerns of faculty at different stages of implementation of the ITESM Educational Model could be predicted from individual differences such as work status group, academic unit, years of teaching at ITESM, educational level, gender, and professional development/MET implementation level. Hypothesis 2 was tested using a multinomial logistic regression in order to predict present concerns of faculty from the level of professional development and other individual differences.

Faculty Concerns Levels Results

The study found that the concerns level of faculty could only be predicted by whether professors were full-time or part-time.

Pearson Chi-Square tests results indicated the following **major findings**:

1. The professors' highest intense concerns level in the *Self* and *Impact* categories were significantly related to whether they were non-users or experienced-advanced users of the ITESM Educational Model.

2. The professors' highest intense concerns level in the *Self* and *Task* categories were significantly related to whether they were full-time or part-time at the Mexico City campus.

Research Question 3 (RQ3)

What administrative leadership interventions are perceived as facilitating the implementation of the ITESM Educational Model (MET)?

Hypothesis 3

It was hypothesized that faculty will have significantly different perceptions of the administrative leadership interventions facilitating the implementation of the MET when individual characteristics are taken into consideration. Hypothesis 3 was tested using a MANOVA analysis for administrative leadership interventions.

Leadership Intervention Factors Results

Professors at the Mexico City campus of ITESM perceived Providing Resources and Arrangements (i.e., Information Technology infrastructure and related support are in place) as the highest Leadership Intervention factor (mean value = 3.248) facilitating the implementation of MET, and Monitoring Progress (i.e., data collection and analyses to assess the effects of the ITESM Educational Model) as the lowest Leadership Intervention (mean value = 1.951). Neither of the leadership interventions factors ranked very high.

Major findings:

1. Faculty had significantly different perceptions of administrative leadership interventions when their work status

(full-time vs. part-time) was taken into consideration relative to the following Leadership Intervention factors: (a) Providing Resources and Arrangements, and (b) Supportive Change Culture.

2. Faculty had significantly different perceptions of administrative leadership interventions when their years of teaching at ITESM (0-2, 3-5, 6-9, or 10 years or more) and educational level (bachelor or master's degree vs. doctorate) were taken into consideration relative to the following Leadership Intervention factors: (a) Ongoing Support/Coaching, and (b) Providing Resources and Arrangements.

Marginally significant findings:

3. Faculty had marginally significant different perceptions of administrative leadership interventions when their professional development/MET implementation level (non-user, inexperienced user, experienced user, experienced-advanced user, or renewing user) and academic unit (Engineering, Business, Liberal Arts, or High School) were taken into consideration relative to the following Leadership Intervention factor: (a) Providing Resources and Arrangements.

4. Faculty had marginally significant different perceptions of administrative leadership interventions when their professional development/MET implementation level (non-user, inexperienced user, experienced user, experienced-advanced user, or renewing user) and educational level (Bachelor or Master vs. Doctorate) were taken into consideration relative to the following Leadership Intervention factors: (a) Supportive Change Culture, and (b) Ongoing Support/Coaching.

In Chapter 5, the researcher first provides a summary of the study's background, objectives, research methods, data analysis, limitations and significance of the study. Based on the major findings of the study, conclusions will be drawn and implications of the findings for future research and practice will be discussed.

Chapter 5: Summary, Conclusions and Implications

INTRODUCTION

This study examined faculty concerns and perceptions of facilitators, barriers, and leadership interventions in implementing a mandated systemic educational change to the teaching learning process—the ITESM Educational Model (MET)—at the Mexico City campus of the Monterrey Institute of Technology and Higher Education (ITESM), headquartered in Monterrey, Mexico.

Chapter 1 outlined the current trends and challenges in higher education and the need for this investigation. Chapter 2 provided literature associated with the research. In Chapter 3, the study's research methods, procedures and instrumentation were addressed. Chapter 4 described the study's sample, data analyses, obtained results and findings. In this final chapter, the researcher will first provide a summary of the study's background, objectives, research methodologies, and data analysis. Then, based on the major findings of the study, conclusions will be drawn and implications of the findings for theory, research and practice will be discussed. Finally, limitations and significance of the study will be given.

STUDY OVERVIEW AND BACKGROUND

There is growing recognition of the need to change the traditional teaching-learning paradigm in higher education. Market forces, global competition, the power of technology, changing demographics, government influence, economics and other worldwide factors bring threats and opportunities to colleges and universities. The need for change in the teaching-learning paradigm is particularly compelling based on the recognition that the traditional teaching-learning approach is no longer the most effective strategy for preparing students to develop the skills and knowledge they need to be successful in a 21st century knowledge-based global economy. Institutions of higher learning are now being challenged to prepare graduates with the following important characteristics: critical thinking, independent learning, problem-solving, teamwork, leadership, and effective decision making. The shift from a teaching to a learning paradigm potentially liberates institutions of higher education from a set of difficult constraints. The learning paradigm envisions colleges and universities themselves as institutions that exist to produce learning instead of institutions that exist to provide instruction. The learning paradigm ends the lecturer's privileged position, honoring in its place whatever approaches serve best to promote learning of particular knowledge with particular students.

In spite of the recognized need for change, few post-secondary institutions have made systemic efforts to change their teaching-learning approach. ITESM is among the first institutions of higher education globally to recognize the need to incorporate new learning approaches into classroom instruction throughout a multi-campus system. ITESM is currently in the process of renewing and changing the university's teaching-learning paradigm in Mexico, and is currently engaged in a large-scale, comprehensive, and long-term effort to change the teaching-learning process mandated by its administration.

ITESM Mandated Systemic Educational Change

ITESM has undertaken a significant challenge in initiating a mandated systemic educational change process. The decision to initiate such a change effort represented a massive challenge for a higher education system as large and geographically distributed as ITESM—the largest private institution of higher education in Latin America with 33 campuses in 29 cities throughout Mexico. The ITESM approach differs from the "bottom-up" approach toward systemic change in higher education as described in Jenlink's model (Jenlink, Reigeluth, Carr, & Nelson, 1996). Yet, such mandated change in the teaching-learning process requires striking a careful balance between academic freedom and academic performance expectations.

In 1995, ITESM initiated a major review of its programs, and a nationwide assessment of current and future educational needs and opportunities. The process involved securing the input of a broad range of stakeholders and experts including students, faculty, staff, alumni, business and industry leaders, and the board of trustees. A total of approximately 12,000 individuals were involved in the process. A new vision of the teaching-learning process was developed and a new mission statement was adopted by the entire system to address the needs identified by the stakeholders. The new vision called for the ITESM system to create new learning environments that incorporated 21^{st} century pedagogies and tools into the teaching-learning process.

THE ITESM EDUCATIONAL MODEL (MET)

The ITESM leadership recognized that the traditional teacher-centered focus on knowledge transfer and systematic instruction emphasized individualized work, and used few technological applications. The ITESM Educational Model that emerged from the national review and assessment focused on implementing a student-centered, technology-assisted teaching-learning process supported by specific didactic methods. The educational paradigm builds on a unique learning philosophy emphasizing knowledge acquisition; the development of specific values, attitudes and skills; and the creation of new learning environments assisted by the use of technology and supported by specific didactic methods, including problem-based, project-oriented, case-based, and collaborative learning approaches.

ITESM FACULTY DEVELOPMENT PROGRAM

Faculty development is one of the most important aspects of educational systemic change, because it is at the professorial level that teaching and learning practices actually change. Faculty and instructional development programs have the potential to support colleges and universities' educational changes and to enhance students' learning. Professional development may be employed as a vehicle for transitioning from a teaching institution to a community of learning. Faculty development and implementation of new ways of teaching and learning go hand in hand.

ITESM leadership recognized that the most essential condition for system-wide change of the teaching-learning process was that of faculty development. It, therefore, initiated an unprecedented and large-scale faculty development effort to enable faculty to develop the skills and knowledge to effectively use the new pedagogical strategies in their instruction. The ITESM Faculty Development Program of Teaching Skills (FDTS) was designed to assist the transformation of faculty teaching practices, from traditional forms of direct instruction through the lecture-based approach, to a technology-assisted, learner-centered model of knowledge construction and active learning. The program was designed to help faculty integrate online and face-to-face collaborative learning into their instructional practices. It represented a formal, major sequential program of professional development for faculty that spanned a multi-year period and included certification upon completion of the program.

STUDY OBJECTIVES AND RESEARCH QUESTIONS

In order to address the purpose of this study, the researcher specifically sought to pursue the following objectives: (a) acquire a deeper level of understanding of faculty perceptions of facilitators and barriers in implementing the systemic educational change process mandated by the administration, (b) identify and analyze faculty levels of concern regarding adoption of the mandated systemic educational change in the teaching-learning process across different stages of implementation, and (c) examine faculty perceptions of change management and leadership interventions that facilitate the implementation of the mandated changes to the teaching-learning environment.

The purpose and the specific objectives of the present study were guided by the following Research Questions (RQs):

1. What are faculty perceptions of facilitators and barriers to the implementation of the ITESM Educational Model?
2. How do individual characteristics and the extent of professional development affect present concerns of faculty regarding adoption of the ITESM Educational Model?

3. What administrative leadership interventions are perceived as facilitating the implementation of the ITESM Educational Model?

RESEARCH METHODOLOGY AND DATA ANALYSIS

This exploratory study relied largely on quantitative-based research methodologies. Research Question 1 (RQ1) and Research Question 3 (RQ3) were assessed using multivariate analysis of variance (MANOVA) in addition to secondary analyses of institutional qualitative data and documents, while Research Question 2 (RQ2) was assessed using multinomial logistic regression. Data was collected from full-time and part-time faculty through a Web-based survey form containing several questionnaires. These questionnaires were Likert Scale-based instruments that were selected, developed, adapted, and translated into Spanish to obtain faculty perceptions of facilitators, barriers, concerns, and leadership interventions in implementing the ITESM Educational Model.

THE CONCERNS-BASED ADOPTION MODEL (CBAM)

To examine faculty concerns and facilitative interventions in the adoption of the MET, the Concerns-Based Adoption Model (CBAM) and related instruments were used. The concerns-based approach addresses key aspects of the educational change process and provides guidance for achieving a higher level of successful implementation of educational innovations, how leaders can and do facilitate change, and how leaders can address obstacles to educational change. The concept of concerns is a useful way to understand the highly complex and dynamic state of emotion and thought that people have in relation to a given educational change or innovation.

The CBAM offers a number of important ways for understanding what change is about, especially as it relates to those involved. Hall and Hord (1998) suggested that the Concerns-Based Adoption Model makes important assumptions: "Change is a process… change is accomplished by individuals as a highly personal experience… change involves developmental growth, and the plan for change must be strategic in nature" (p. 6). Educational policies must address the need for multi-year implementation support because systemic change's implementation takes time.

CONCLUSIONS

This section provides the study's conclusions, based on the findings detailed in Chapter 4. Conclusions are presented in accordance with the three research questions guiding the study.

Research Question 1 (RQ1)

What are faculty perceptions of **facilitators** and barriers to the implementation of the ITESM Educational Model (MET)?

It was hypothesized that faculty at different levels of adoption will have significantly different perceptions of the facilitators to the implementation of the MET when individual characteristics are taken into consideration.

Faculty Perceptions of Facilitators

Effective educational leaders need to recognize and understand the factors that facilitate the implementation of educational changes. Forces that help academic administrators achieve educational changes are called facilitators or driving forces. For the purpose of this study and based on the facilitators factor analysis indicated in Chapter 3, the researcher identified a set of six facilitator factors [(1) Students Acceptance of Change, (2) Adoption/Adaptation of Courses, (3) Institutional Change Culture, (4) Ongoing Support and Training, (5) Faculty Academic Background, and (6) Professional Learning Community] to be predicted from faculty's individual characteristics such as work status, professional development/MET implementation level, academic unit, years of teaching at the institution, educational level, and gender.

Major findings and their related conclusions are provided next.

Major Finding 1. Faculty had significantly different perceptions of **Facilitators** when their work status (full-time vs. part-time) and educational level (bachelor or master's degree vs. doctorate) were taken into consideration regarding the following facilitator factors: (a) Faculty Academic Background, (b) Institutional Change Culture, and (c) Students Acceptance of Change.

Conclusion 1. Work Status by Educational Level

Based on the results obtained from the MANOVA analysis, part-time faculty with doctorates perceived the following facilitator factors as particularly important: students acceptance of change, institutional change culture, and faculty academic background.

Part-time faculty with doctorates perceived the students' trusted participation in and acceptance of educational change and use of technology—*students' acceptance of change*—as a more important facilitator in implementing the MET than full-time professors with doctorates. Most doctoral level part-time faculty at the Mexico City campus are full-time professors at other institutions of higher education. Therefore, these professors are able to compare students' attitudes, needs, and trusted participation in different educational settings. In addition, doctoral level part-time professors have limited interaction with the ITESM students because of their other responsibilities and limited time on campus. Based on the more limited contact with ITESM students, the part time faculty may be less aware of or sensitive to students concerns or dissent with the MET.

It can be concluded that the *students acceptance of change* was perceived as an important facilitator in the adoption of the MET by doctoral level part-time faculty because their students' trusted participation and acceptance of educational change helped them to become more engaged in the implementation process.

Likewise, part-time faculty with doctorates had a very positive perception of the *institutional change culture* as a facilitator in implementing the MET. As indicated above, most doctoral level part-time professors are full-time professors at other colleges and universities. As they spend more time in different educational environments, the ITESM change culture may be more noticeable to them and they are able to perceive the implementation of the MET as an important priority propelled by the institution's strong philosophy and culture. According to Astin and Sherrei (1980) such a change culture may come from a combination of leadership styles that can definitely create the proper conditions to facilitate educational innovations at institutions of higher education with strong change culture as ITESM.

Finally, *faculty academic background* was perceived by doctoral level part-time professors as having an important facilitation effect to implementing the MET. This faculty group considered their own academic trajectory and background (years of teaching experience, pedagogical skills, and academic field) as an important facilitator in implementing the mandated educational innovation.

Why? The doctoral level part-time professors, most of them with full-time responsibilities at other institutions of higher education, have fewer opportunities to participate in the Faculty Development of Teaching Skills (FDTS) program and therefore, perceived their own background, training, experience, and "intrinsic motivation force" (Ward, 1995, p. 31) as more important in facilitating the implementation of the MET.

Major Finding 2. Faculty had significantly different perceptions of **Facilitators** when their professional development/MET implementation level (non-user, inexperienced user, experienced user, experienced-advanced user, or renewing user) was taken into consideration regarding the following facilitator factors: (a) Ongoing Support and Training, (b) Institutional Change Culture, (c) Adoption/Adaptation of Courses, and (d) Faculty Academic Background.

Conclusion 2. Professional Development/MET Implementation Level

Educators and researchers have agreed on the importance of faculty training and development for the successful implementation of educational innovations. For institutions to remain at the forefront of higher education, faculty development initiatives are of prime importance (Kolbo & Turnage, 2002). The literature indicates that changing teaching-learning practices does not occur through a single seminar, didactic intervention or as the result of an institutional declaration. It requires both ongoing support and training (Hall and Hord, 2001).

In accord with Hall's view, the research findings indicated that the faculty professional development process required to implement the MET was facilitated by *ongoing support and training*—support provided by pedagogical and technological advisors from ITESM Learning Technology Centers.

Experienced user faculty perceived *ongoing support and training* as an important factor in their change process. Due to the strategic orientation of professional development at the ITESM system, the faculty change process is inextricably related to the institutional FDTS program. The FDTS program was designed as a well-structured, multiple-stage effort. This sequential program considered the faculty transitioning from non-users of the MET (1^{st} stage) to higher using-levels of the MET depending on the extent and type of ongoing support and training. It is at the experienced-user level that faculty require important support and training from pedagogical and technological staff, because they have already "redesigned" their courses and are able to use them with their students. The results indicate that, at higher levels of professional development/MET implementation, ongoing support and training continues to have some facilitation effect, but is less intense.

A potential explanation is that experienced users of the MET found this stage as a "tipping point" in their integration of new ways of teaching and learning and expressed a continued strong need for ongoing support and training.

These findings are in accord with Angelo's (1989) approach to faculty development focusing on learners and learning. Angelo suggests that faculty developers should avoid traditional approaches to teaching and teachers and should eliminate the barriers that impede learning improvement. Support and training from pedagogical and technological staff during the experienced-level stage may help to overcome or lower these barriers.

The *institutional change culture*—ITESM's strong philosophy and valued-based culture promoting innovation, change, and entrepreneurial spirit—was also perceived as a facilitator to implementing the MET. Faculty involvement in the change process is facilitated by the institutional context that supports new ways of teaching and learning. "Change is successfully implemented in a culture of innovation, collaboration and coordination where all participants in the system are involved in the change effort" (Menchaca, Bischoff, & Dara-Abrams, 2003, p. 3).

The growing perception of the institutional change culture as an important facilitator factor was associated with the experienced and advanced levels of the MET implementation process, reaching its peak value at the advanced user level. It can be concluded that the *ITESM change culture* has positively driven the implementation of the MET, and helped faculty move towards the desired learning environment. Clear institutional statements, goals, and the appropriate allocation of resources are examples of the ways the change culture has contributed to the adoption of the MET. According to Blake, Mouton, and Williams (1981) team-leadership is the most effective way to support teaching and learning and to handle other related administrative tasks. These authors note that team administration helps academic administrators to build and lead a culture for successful educational innovations because, within their "management grid" approach, there is a balance between the administrators' concern for institutional performance and concern for people. Such a balance between the academic administrators' concern for the performance of the MET and concern for faculty was desired since the early stages of the change process at ITESM.

Along with the *institutional change culture* and *ongoing support & training* factors, other facilitative actions were identified as positively influencing the faculty. For example, the *faculty academic background*—professors' individual academic discipline, years of teaching experience, and pedagogical skills—was perceived as having an important facilitation effect by experienced users of the MET. The Experienced-level professors transition from the early stages of the MET implementation towards the more advanced stages was a uniquely personal process. Experienced-level faculty realized that new ways of teaching and learning were easily implemented if they relied on their prior teaching experience and, at the same time, were able to learn new pedagogical skills. According to Hall and Hord (1998), change is a highly personal process and involves developmental growth. Thus, the adaptation of change by faculty is a developmental process that can be supported by faculty development initiatives such as the FDTS program. It can be concluded that faculty pedagogical skills developed by means of the FDTS program, facilitated the implementation of the MET.

Regarding years of teaching experience, it cannot be concluded that either a greater or lesser number of years of teaching experience facilitated the MET implementation.

The study findings identified the possibility for faculty to adopt and make adjustments to system-level high-quality redesigned courses—*adoption / adaptation of courses*—as an important facilitator to implementing the MET. As indicated in Chapter 2 (pp. 93-96), the design of the FDTS program considered two alternative approaches. First, a more intensive option (185 hours) for full-time faculty focused on developing new redesigned courses and second, a less intensive option (127 hours) for part-time faculty focused on encouraging the adoption/adaptation of system-level courses, most of them previously developed by their full-time colleagues. This facilitating factor appeared quite important to inexperienced users, to whom the change process seemed to be very challenging. Designing and testing a course that meets MET specifications is a highly time-consuming effort, thus, the opportunity to adopt and modify high-quality courses developed by other colleagues at the system level paves the way for the implementation process. It can be concluded that the institutional strategy aimed at the support for adopting and adapting high-quality system-level courses became an important facilitator to implementing the MET.

Faculty Perceptions of Barriers

What are faculty perceptions of facilitators and **barriers** to the implementation of the ITESM Educational Model?

It was hypothesized that faculty at different levels of adoption will have significantly different perceptions of the barriers to the implementation of the MET when individual characteristics are taken into consideration.

Change facilitators and educational leaders need to identify, understand, and help remove factors that obstruct the implementation of educational innovations. Forces that work against intended educational changes are called barriers or restraining forces. For the purpose of this study and based on the barriers factor analysis indicated in Chapter 3, the researcher identified a set of eight barrier factors [(1) Monitor Implementation, (2) Top-Down Leadership, (3) Students Adaptation to Change, (4) Infrastructure Operational Problems, (5) Time, (6) Administrative Alignment and Support, (7) Support Shortcomings, and (8) Faculty Issues] to be predicted from faculty individual characteristics such as work status, professional development/MET implementation level, academic unit, years of teaching at the institution, educational level, and gender.

The barriers major finding and its related conclusions are provided next.

Major Finding 3. Faculty had significantly different perceptions of **barriers** when their work status (full-time vs. part-time) and professional development/MET implementation level (non-user, inexperienced user, experienced user, experienced-advanced user, or renewing user) were taken into consideration regarding the following barrier factors: (a) Support Shortcomings, (b) Infrastructure Operational Problems, and (c) Administrative Alignment and Support.

Conclusion 3. Work Status by Professional Development/MET Implementation Level

Based on the results obtained from the MANOVA analysis, the most important barriers to implementing the MET as perceived by faculty were *support shortcomings* and *infrastructure operational problems*.

Although *top-down leadership* obtained the highest mean response (3.74) from the faculty, it did not surface as an important barrier in the MANOVA analysis, even though ITESM has a hierarchical structure promoting centralized decision-making processes. This result may be explained by the fact that the implementation of the MET was mandated by the ITESM central administration and most professors perceived a strong institutional commitment and solid rationale for the educational change.

Part-time and full-time faculty had different perceptions of the restraining effect of support deficiencies as a barrier during the implementation process. *Support shortcomings* proved to be a critical barrier to new and inexperienced part-time professors, compared to their full-time colleagues. Part-time and full-time professors have different levels of engagement and time availability devoted to participate in all aspects of the institutional academic life. Part-time professors have limited time on campus because of their other professional responsibilities. Consequently, many more full-time faculty were able to achieve faster and higher levels of advancement in the FDTS program. Likewise, full-time professors are continuously exposed to the institutional change environment, and are thus more easily assisted by their colleagues, the academic administrators, and other staff members. New and inexperienced part-time faculty had not yet developed a network of people to rely on for help and ongoing support due to their limited teaching experience at ITESM. Therefore, support deficiencies and lack of support from technological and pedagogical staff during the MET implementation process seriously affected these part-time professors when compared to new and inexperienced full-time faculty who had additional sources of support (e.g., experienced full-time colleagues) on campus.

Interestingly, part-time professors who have reached advanced levels within the FDTS program did not perceive *support shortcomings* as a barrier when compared to advanced full-time or even part-time renewing users. It is possible that part-time advanced users have reached certain skills-based "competence level" in implementing the MET as a result of their own advancement in the FDTS program, and are able to more quickly master technical and pedagogical issues compared to full-time advanced users. Another explanation may be that part-time advanced users are used to working more independently and require less support and assistance. According to Hord and Huling-Austin (1986), faculty need specific facilitative interventions during different stages of the change process. Within these authors' six-component framework, the most frequent interventions supporting school change occur in the first stages of implementation. Part-time advanced users may have tended to take a more pragmatic approach to the implementation of the change process, as it only represented one aspect of their professional life, thus requiring less support and assistance—whereas full-time colleagues may have viewed the change process as having a more profound and enduring impact on the way they work and teach.

Similarly, *infrastructure operational problems*—failures in the proper operation of technological platforms, computational server operational failures, and maintenance of IT infrastructure—surfaced as an important barrier, depending on the faculty's stage of implementation and their work status. Specifically, the perception of the barrier effects of *infrastructure operational problems* was almost constant for full-time faculty at different stages of the implementation process.

Non-user level part-time faculty perceived *infrastructure operational problems* as an important barrier, compared to advanced-user level part-time professors. Clearly, faculty members with lower levels of exposure to the implementation of the MET experienced greater difficulties with the new technology required for its implementation. Faculty at the advanced stage of implementation, however, did not perceive the barrier effect of *infrastructure operational problems*. Advanced users of the ITESM Educational Model had higher levels of exposure to the implementation of the MET and the FDTS program. These findings are consistent with Kappan (1996) who indicated that it is "one thing is to use technology in a classroom and quite another to make technology a potent force in transforming an entire educational system" (p. 70).

Full-time experienced users of the MET perceived *administrative alignment and support*—the lack of alignment of administrative processes with the MET and differences in the objectives between administrative support areas and academic units—as an important barrier to implementing the MET, compared to part-time experienced users, who perceived this barrier factor as a minor problem that did not significantly affect them. These perceptual differences may be explained by the higher level of alignment and support for pursuing systemic educational change expected by full-time faculty as compared to their part-time colleagues.

It may be concluded that a lack of alignment of administrative processes (e.g., students' registration, library support, computational services, etc.) and differences in the objectives between administrative support areas (e.g., administrative services, physical plant, student affairs, etc.) and academic units were more evident and frustrating to full-time experienced users, because they were expecting the implementation of the MET to include a more comprehensive systemic educational change process affecting all processes and areas of ITESM, as suggested by Banathy (1991) and Reigeluth & Garfinkel (1994). These authors considered a change to be *systemic* when it is comprehensive, thereby affecting and pervading all components and levels of the educational system. Thus, ITESM systemic educational change must take into consideration the impact of change on all parts of the institution (e.g., course schedules and registration, library services, IT infrastructure, administrative services, student affairs offerings, etc.) as well as the relationships between these component parts.

As a consequence of the much higher and more regular contact with their department chairs and deans, full-time professors perceived their academic administrators' lack of clear understanding of the ITESM Educational Model as an important barrier to its implementation. The perception that several department chairs may lack a clear understanding of the MET may be the result of several factors. For example, Austin and Moore (1999) stated that department chairs and faculty members sometimes found it challenging to interpret "change messages" from senior leaders. Some department chairs at ITESM are relatively inexperienced in their post, and require time and training to become effective facilitative leaders. In some instances, department chairs or deans were not viewed by their faculty as leading role-models in implementing the MET, because their engagement with the MET implementation was limited and their teaching-learning approaches remained unchanged. Carr (1996) stated that systemic change recognizes the role of leadership in any changing system. According to this author, changing an educational paradigm requires shifting the academic administrators' leadership and power. It may be concluded that inexperienced department chairs and the lack of effective role-modeling from these educational leaders at the Mexico City campus was perceived as an important barrier by full-time experienced users of the MET.

In summary, faculty perceptions of facilitators and barriers to the implementation of the MET were closely related to work status, professional development and educational level. The literature has indicated that faculty and academic administrators have different perspectives of what facilitates and impedes the adoption of educational innovations. According to Astin and Sherrei (1980), research has shown that a combination of positive leadership styles can help create the proper conditions to overcome barriers and obstacles when educational innovations are introduced. According to Hall and Hord (2001) "professional development and implementation are two merged, complementary concepts" (p. 6) representing the soul and mind of educational innovations. These two interdependent variables have a natural relationship with work status. Full-time faculty usually stay longer at ITESM and thus have greater levels of exposure and engagement with the institutional academic environment. Therefore, they also have higher extent levels of professional development and in-depth understanding of the MET. Under these circumstances, part-time and full-time faculty surfaced different perceptions of what helps and obstructs new ways of teaching and learning at ITESM.

Research Question 2 (RQ2)

How do individual characteristics and the extent of professional development affect **present concerns of faculty** regarding adoption of the ITESM Educational Model (MET)?

It was hypothesized that present concerns of faculty at different stages of implementation of the MET could be predicted from individual differences such as work status, academic unit, years of teaching at ITESM, educational level, gender, and professional development/MET implementation level.

Faculty Concerns Levels

According to the literature (Fuller, 1969; Hall & Hord, 2001), people involved in educational innovations can be characterized by their concerns, which generally tend to range within the Self, Task or Impact categories. Self concerns suggest a focus on the needs of the individual. Task concerns focus attention on the increasing demands of using an educational innovation. Impact concerns look beyond the users (e.g., professors) and examine the influence on the clients (e.g., students). Devoted time to facilitate educational innovations and powerful leadership interventions (e.g., support and assistance) can positively influence individuals' concerns. Specifically, this exploratory study focused on the influence of individual characteristics—work status, professional development, academic unit/school, educational level, years of teaching at the institution, and gender—and the extent of professional development on the present concerns of faculty (as of Fall 2003) regarding adoption of the MET at the Mexico City campus.

Major findings and their related conclusions are provided next.

Major Finding 4. The concerns level of faculty could only be predicted by whether professors were full-time or part-time. Specifically, the professors' concerns level in the **Self** and **Task** categories were significantly related to whether they were full-time or part-time faculty.

Conclusion 4: Concerns Level by Work Status

The present concerns level of faculty at the Mexico City campus were significantly related to their work status (full-time vs. part-time). Based on the Pearson Chi-Square results, the independent variable that most effectively explained faculty concerns was work status. It appears that the level of "the composite representation of the feelings, preoccupation, thought, and consideration (i.e., concerns)" (Hall, 2001, p. 61) given to the implementation of the MET varied according to the individual's view of his/her role in the institution and his/her understanding of the institutional context as a whole. For example, part-time professors tend to regard themselves as complementary educational actors, versus full-time professors who regard themselves as more substantive-formative individuals.

Educational innovations require that college and university teachers learn new approaches to teaching and learning. Innovative educational approaches usually demand new perspectives and different skills for faculty (Hall & Hord, 1998). According to these authors, innovative educational changes can be better understood in operational terms through highly personal experiences. When an individual is learning new skills, more and deeper opportunities to practice such skills lead to higher levels of concern. The more practice an individual has in employing new skills, the better they become at using them. The more an individual improves, the more comfortable they feel in using these skills. More comfort leads to less focus on self and task concerns, and facilitates the disclosure of impact concerns. Therefore, the individual change process just described leads to higher levels of faculty concerns.

It can be concluded that the Self concern category—indicating a concern about teaching, but with the focus on the professor him/herself—was more representative of the average part-time faculty member due to a "slower" and sometimes more challenging process in the adoption of the educational change. Part-time faculty usually have fewer years of teaching experience at ITESM and their exposure to the institutional professional development program is, therefore, more constrained and limited. Part-time faculty do not have as much time to engage in the implementation of innovative teaching-learning processes, or to receive the required support to better enable them to achieve higher levels of confidence and become more comfortable with new educational practices. Therefore, their concerns remain at a low level (Self concerns).

Full-time professors, on the contrary, evolved more quickly into the Task concern category—indicating a concern about teaching, but with focus on the act of teaching—as a result of their more intense experience and contact with innovative teaching-learning environments, and their own exposure to other colleagues' experiences throughout the full working day. It is usually the case that full-time professors are more comprehensively involved in the ITESM Faculty Development of Teaching Skills Program. Full-time faculty and staff usually have the opportunity and obligation to achieve higher levels of involvement with and commitment to educational innovations, and to the institution as a whole. They are more able to develop higher skill levels and, therefore, become more comfortable with their use. Thus, full-time professors tend more easily toward Impact concerns. Comfort is the absence of anxiety, and this affective dimension consequently facilitates the implementation process of an educational innovation.

In summary, full-time faculty have more time to be involved in and practice educational innovations that lead to higher levels of competence, confidence, and comfort. On the other hand, part-time faculty have less time to be deeply involved and to practice educational innovations, and, therefore, develop fewer skills, less competence, and less confidence and comfort than full-time faculty. Thus, their concerns tend to remain at the lower level (i.e., Self).

Major Finding 5. Present concerns of faculty could be predicted by their professional development/MET implementation level. Specifically, the faculty members concerns level in the **Self** and **Impact** categories were significantly related to whether they were non-users or experienced-advanced users of the ITESM Educational Model.

Conclusion 5. Concerns Levels by Professional Development/MET Implementation

Fuller (1969) considered that college faculty and teacher concerns are influenced by professional development. Robust professional development affects the faculty concerns level. Consequently, professional development constitutes an important variable in implementing educational innovations. Hord (2001) suggested that development and implementation are two sides of the same coin and constitute an indivisible concept.

Based on the Pearson Chi-Square results, professional development/MET implementation level effectively explains faculty concerns. In this study, the researcher characterized professional development/MET implementation in five categorical levels: (1) Non-user (the lowest level), (2) Inexperienced user, (3) Experienced user, (4) Experienced-Advanced user, and (5) Renewing user (the highest level).

Professional development at ITESM was determined to be a fundamental strategy in supporting the implementation of the MET. As indicated earlier, the FDTS program was designed as a well-structured, multiple-stage intensive effort seeking "certification" upon completion. It addresses a varying number of topics such as higher education needs and challenges, systemic educational change, infusion of technology into new ways of teaching and learning, different didactic methods, and pedagogical and technological support for redesigning courses. Due to the nature of the ITESM FDTS program, time devoted to professional development has usually contributed to the achievement of higher levels of implementation of the MET. Therefore, faculty with significant advancement in this program achieved higher levels of understanding in implementing changes in the teaching-learning process. It can be concluded that higher levels of understanding coupled with significant practical experience in implementing the MET lead to higher levels of concern. Professors at advanced levels of the professional development process reached the Impact concerns level. According to Hall and Hord (2001), *Impact* concerns are associated with the upper-level stages of consequence, collaboration and refocusing of educational innovations (p. 61). These upper-level stages of concern represent the ultimate goal for professors involved in educational innovations. The consequence, collaboration, and refocusing stages include faculty expressions of concern that focus on students, other professors, and better ways of teaching and learning (Evans & Chauvin, 1993).

Higher levels of professional development provide more in-depth, specific, and detailed knowledge contributing to deeper levels of understanding of the educational innovation and better use of the new ways of teaching and learning. Advanced levels of professional development also provided faculty with greater competence and confidence leading to higher stages of concern that enable them to seek different ways of improving the innovation processes. Finally, as individuals become more competent and proficient in their own use of the educational innovation, they become effective change facilitators to other colleagues. As facilitators, they are able to provide assistance and support, and share the didactic methods that result in enhanced learning environments.

A faculty member's view and understanding of their role is closely related to their current stage of the MET implementation. Due to the importance and design of the ITESM professional development program, it was expected that faculty teaching practices would evolve from teacher-centered knowledge transmission learning environments, toward the development of student-centered learning environments as faculty advanced through the FDTS program.

It can be concluded that the Self concern category—indicating a concern about teaching, but with focus on the professor him/herself—included higher numbers of non-users of the MET, as their exposure to ITESM professional development had generally been limited, and consequently, these professors tended to maintain a more traditional, direct-instruction approach. According to the CBAM model (Hord, 1987), non-user professors will rarely display concerns about the consequences, collaboration and refocusing of their teaching described by the Impact concern category. Likewise, advanced users of the MET—people in the last stage of the professional development program prior to reaching the "certified" level—did not demonstrate the awareness, informational or personal stages of concern described by the self concern category—concerns about teaching but within an egocentric frame of reference—but, rather, demonstrated higher levels of concern.

In summary, faculty concerns regarding adoption of the ITESM Educational Model at the Mexico City campus were significantly related to their work status and professional development/MET implementation level. "Development comprises all of the activity related to creating an innovation, while implementation addresses establishing the use of innovation at adopting sites" (Hall et al., 2001, p. 6). It can be concluded that years of teaching, work status and professional development have a natural and close relationship. Full-time professors usually stay longer at the institution than their part-time colleagues. Therefore, full-time faculty have a greater number of years of teaching at ITESM, have higher extent levels of professional development, and more experience in working with the MET. As a consequence, the level of concerns related to the adoption of the MET are at much higher levels (Impact) than those who are at lower levels of professional development.

Research Question 3 (RQ3)

What administrative **leadership interventions** are perceived as facilitating the implementation of the ITESM Educational Model (MET)?

It was hypothesized that faculty will have significantly different perceptions of the administrative leadership interventions facilitating the implementation of the MET when individual characteristics are taken into consideration.

Faculty Perceptions of Leadership Interventions

Transformational leaders (Fisher, 1996) need to identify, understand, and conduct actions and behaviors facilitating educational change in colleges and universities. According to Hord (1992), a better understanding of leadership for educational change is of high importance. For the purpose of this study and based on the leadership interventions factor analysis indicated in Chapter 3, the researcher identified a set of six leadership intervention factors [(1) Supportive Change Culture, (2) Time and Resources for Professional Development, (3) Monitoring Progress, (4) Ongoing Support/Coaching, (5) Providing Resources and Arrangements, and (6) Continuous Communication] to be predicted from faculty individual characteristics such as work status, professional development/MET implementation level, academic unit, years of teaching at the institution, educational level, and gender.

Facilitative leadership focuses on how leaders can and do facilitate change or how leaders can overcome obstacles to educational change. Although ITESM academic administrators were meant to lead the mandated change process from the early stages of implementation, the institution's professional development program provided limited opportunities and resources to help them understand how to become effective change agents, how to assist faculty with the new instructional strategies, or how to address other faculty needs and concerns. As a consequence, the faculty perception of facilitative leadership interventions obtained lower mean ratings.

Major findings and their related conclusions are provided next.

Major Finding 6. Faculty had significantly different perceptions of administrative leadership interventions when years of teaching at ITESM (0-2, 3-5, 6-9, and 10 years or more) and educational level (bachelor or master's degree vs. doctorate) were taken into consideration regarding the following Leadership Intervention factors: (a) Ongoing Support/Coaching, and (b) Providing Resources and Arrangements.

Conclusion 6. Years of Teaching by Educational Level

Based on the results obtained from the MANOVA analysis, the most important leadership intervention factors that facilitated the implementation of the MET were: Ongoing Support/Coaching and Providing Resources and Arrangements.

Professors with 10 or more years of teaching at the institution, whether with a bachelor, master or doctoral degree, did not perceive that their academic administrators encouraged them to continually improve their MET implementation through a positive educational environment. It appears that academic administrators tended to focus less attention on the more experienced faculty members who required less supervision as compared with professors with fewer years of teaching at ITESM. However, these experienced-level professors were apparently expecting robust and ongoing support from their department chairs, school deans, and other staff members.

It can also be concluded that professors with more years of teaching experience at ITESM have a larger network of people to rely on, have a better understanding of the institutional culture (e.g., paths, bridges, resources and gateways), and have a better understanding of the ITESM leadership structure and academic administrator leadership styles, compared to faculty with fewer years of teaching experience at the institution having less knowledge and engagement with the institution. It seems that facilitative change leadership was a neglected area in policy implementation by some academic administrators in the Mexico City campus. As suggested by Hord (1992), ongoing time and energy need to be devoted to facilitative leadership actions to effectively support the adoption of an educational innovation as in the ITESM case.

Major Finding 7. Faculty had significantly different perceptions of administrative leadership interventions when their work status (full-time vs. part-time) was taken into consideration regarding the following leadership intervention factors: (a) Providing Resources and Arrangements, and (b) Supportive Change Culture.

Conclusion 7. Work Status

Based on the results obtained from the MANOVA analysis, the most important leadership intervention factors that facilitated the implementation of the MET were: Providing Resources and Arrangements and Supportive Change Culture.

Administrative leadership interventions refer to the actions and behaviors of the Mexico City campus leaders (academic administrators such as the campus president, the director for academic development, the deans of all academic units/schools, and the department chairs) that facilitate the mandated educational change. The institutional supportive change culture of collaboration and educational innovation cultivated and promoted by these academic administrators to positively encourage faculty to continually improve adoption of the MET was perceived as an important facilitative leadership intervention. These results are in accord with Bensimons' (1993) findings that the team-oriented leadership approach used by academic administrators' helps to build a cohesive, interactive, and collaborative learning environment among faculty.

Part-time professors perceived the *supportive change culture* as having a higher facilitation effect in implementing the MET than full-time professors. It can be concluded that full-time and part-time professors experienced in a different way the leadership interventions conducted by academic administrators, due to their varying levels of involvement, experience, and engagement within the institution. Full-time faculty are in continuous contact with the facilitative leadership actions provided by department chairs and academic deans. They are accustomed to more frequent and intense contact, and they can easily receive support on a regular basis. At the same time, full-time professors are used to the unique environment of higher education (usually a more free, respected and egalitarian atmosphere when compared to the "external world" of business, large corporations, or the government) and do not have a comparative frame of reference with other work environments. Part-time faculty, on the contrary, have limited time on campus and are exposed to fewer facilitating leadership interactions from their own colleagues, academic administrators, and other staff members. It may be concluded that part-time professors tend to fully appreciate the ITESM supportive change culture while on campus, and are willing to participate in such a cooperative environment.

Part-time professors perceived *Providing Resources and Arrangements*—Information Technology (IT) infrastructure and related support are in place—as having a higher facilitating effect, compared to full-time professors. It seems that part-time faculty are more sensitive to the IT-based component of the MET, due to their more practical orientation. This group of professors has less time to deeply reflect upon and are less affected by the MET in the context of their entire professional life. They may also be more competent and comfortable in using technology in other settings and may consequently tend to over-emphasize the role of technology in assisting the desired teaching-learning environment.

Full-time professors, on the other hand, may tend to focus more on the theoretical-cognitive framework of the teaching-learning process itself. Just as Kappan (1996) suggested, the successful transformation of student learning and accomplishment requires effectively bringing together a consensus about teaching and learning, well-integrated uses of technology, and restructuring. Kappan's perspective suggests the importance of making sure all professors (full-time and part-time) acquire a deep level of understanding of the MET; its theoretical background, scope, implications, specific attributes, and use of technology under a holistic restructure of the teaching-learning paradigm.

In summary, facilitative leadership represents an important factor to effectively bring about systemic educational change. With regard to faculty perceptions of administrative leadership interventions, it can be concluded that there is a close relationship between years of teaching and work status. Full-time professors usually stay longer at the institution than their part-time colleagues. Therefore, full-time professors have a greater number of years of teaching at ITESM, have higher exposure levels to the FDTS program, and they are more engaged in the MET implementation.

Final Conclusions

Data analysis, obtained results and major findings for all research questions indicated that work status and professional development/MET implementation level appeared as the study's most important individual characteristics of faculty in implementing the ITESM Educational Model.

Regarding work status, the faculty at the Mexico City campus of ITESM is composed of 978 full-time and part-time professors for the Fall 2003 semester.

Full-time professors are more closely related to the ITESM institutional culture, are more highly exposed to the institutional systemic change process, are closer to facilitative leaders, and are usually more involved in and committed to participating in the change process than part-time professors. Faculty concerns and perceptions of several facilitators, barriers and administrative leadership interventions in implementing the MET can be explained by the individuals' work status.

Regarding professional development/MET implementation level, several authors (e.g., Fuller, Hall & Hord, Kolbo & Turnage) indicate that professional development is a key factor for systemic educational change. From the early stages of the MET implementation at ITESM, professional development became an institutional strategy in facilitating the adoption of the new teaching-learning process. The high number of part-time faculty at ITESM with time limitations, less involvement with the institution, and less continuity as professors also had fewer opportunities for participation in the Faculty Development of Teaching Skills (FDTS) program. As indicated earlier, professional development and MET implementation level were identified as a complementary, indivisible concept. "Development and implementation are two sides of the same coin. Development comprises all of the activity related to creating an innovation, while implementation addresses establishing the use of innovation at adopting sites"(Hall & Hord, 2001, p. 6).

It can be concluded that work status and professional development are highly intertwined in the MET implementation process. The design of the FDTS program explains this tight relationship. The professional development path of faculty members at the Mexico City campus of ITESM depends on whether they are full-time or part-time. Consequently, part-time and full-time professors with varying levels of professional development experienced different concerns and had different perceptions of facilitators, barriers and administrative leadership interventions while implementing the ITESM Educational Model.

IMPLICATIONS OF THE STUDY

This exploratory study contributed to the body of knowledge in higher education systemic change processes by identifying the concerns of faculty and by determining the perceptions of the facilitators, barriers, and successful administrative leadership interventions in changing teaching-learning practices within their institution. Study results address important linkages to prior research related to systemic change, new approaches to teaching and learning, concerns of faculty while implementing educational changes, factors that facilitate or impede implementation of educational innovations, and professional development.

Based on the growing recognition of the need to change the traditional teaching-learning paradigm in higher education, previous research efforts such as the American Council on Education (ACE) study (1997), the Business-Higher Education Forum (BHEF) Reports (1997 & 2003), UNESCO's World Declaration on Higher Education (1998), and other publications [Dolance & Norris (1995); Banathy (1991); Oblinger & Verbille (1998), Barr (1995)] conclude that the traditional, direct-instruction teaching approach is no longer the most effective strategy for preparing students to develop the skills and knowledge they need to be successful in a 21st century knowledge-based global economy. This same conclusion was also reached by ITESM stakeholders after a major review of its programs and a nationwide assessment of its needs and challenges in Mexico leading to a new mission statement (ITESM, 1998) and the redefinition of a new teaching-learning paradigm referred to as the ITESM Educational Model (Martin, 2002).

After a 9-year period, the implementation of the MET represents a massive, long-term and large-scale institutional effort providing evidence that mandated change can work under conditions of positive ongoing support, appropriate professional development, and development of a shared vision facilitated by the ITESM leadership, which in turn is shaped by a strong institutional culture. These results are well-described by the theory-based and practical frameworks contained in Hall & Hord's *Taking Charge of Change* (1998) and *Implementing Change* (2001). There are few cases of post-secondary institutions that have launched a system-wide implementation of a mandated systemic change of their teaching-learning processes. Results and findings of this case study of faculty concerns and perceptions of mandated educational change provide a research-based reference in the field of higher education administration.

Faculty at the Mexico City campus perceived *support shortcomings*, *infrastructure operational problems,* and *administrative alignment and support* as the most important restraining forces in implementing the MET. These barriers are related to people issues, IT infrastructure (hardware and software issues), as well as administrative-based procedures. All together, this set of powerful barriers help sustain the traditional teacher-centered approach to education along with other restraining forces such as inertia and unwillingness to change. Such a context was previously analyzed by Garvin and Sweet (1992), who grouped barriers impeding the adoption of educational innovations into different categories. In the end, the diverse type of barriers (e.g., personal, institutional, political, epistemological, and practical) in implementing the MET emphasized the need for true systemic educational change affecting and pervading all parts and components of the educational system, as indicated by the research works of Banathy (1991) and Reigeluth and Garfinkel (1994).

The key facilitator factors in implementing the MET and the most important leadership interventions facilitating its implementation were *the institutional change culture, faculty academic background*, *ongoing support and training, providing resources and arrangements, ongoing support, and supportive change culture.* This group of driving forces and facilitative change actions are meaningful when associated to prior research by Hall and Hord (1987, 1998, & 2001). The CBAM model developed by these authors has its secondary focus on how leaders can and do facilitate change or how leaders may obstruct change. The CBAM's categories of change interventions suggested that to successfully lead educational innovations it is important to invest in development and training, provide support and continuous assistance, planning and providing resources, develop a shared vision of change, and create a context supportive of educational change. The ITESM philosophy, unique culture and implementation strategy included most of the elements identified by Hall and Hord and mirror a real case of systemic educational change in Mexico with their *Implementing Change* (2001) perspective.

The CBAM's primary focus is on faculty and staff—people at the "front lines—who have to implement educational changes. Based on the ideas proposed by Frances Fuller (1969) and her colleagues at the Research and Development Center for Teacher Education at the University of Texas at Austin, and the later work of Hall and Hord, the researcher of this exploratory study relied on their "Stages of Concern Model" to understand ITESM faculty concerns regarding adoption of the MET. Study results indicated that the faculty concerns levels concentrated in the *Self* and *Impact* categories and were correlated to the individual's work status (part-time vs. full-time) and extent of professional development. These two variables are closely related and help explain the transitioning evolution of faculty from the *self, task* and *impact* concerns while implementing the ITESM Educational Model.

Overall Implications for Theory

The ITESM system has a hierarchical leadership structure shaped by a unique institutional culture. Once the mission was set in place in 1995, change to the ITESM teaching-learning process was mandated. Mandated change is the opposite of the democratic decision-oriented approach to changing fundamental beliefs and teaching practices recommended by the notion of ownership of a shared vision of a new educational system (Jenlink et al., 1996).

A mandate is one kind of strategy that is used widely in educational change. Although mandates are continually criticized as being ineffective because of their top-down orientation, they can work quite well under certain conditions. "With a mandate the priority is clear, and there is an expectation that the innovation will be implemented. When a mandate is accompanied by continuing communication, ongoing training, on-site coaching, and time for implementation, it can operate quite well" (Hall & Hord, 2001, p. 14). This study was conducted based on a theory of mandated change (Hall & Hord, 2001) that suggests the need for: (1) continuing communication, (2) ongoing training, (3) on-site coaching, and (4) time for implementation.

Six categories of leadership/change facilitation interventions were examined in the systemic change process addressed in the study. From the six categories, Providing Resources and Arrangements—information technology infrastructure and related support were in place—was deemed the most helpful. The least helpful interventions indicated by the faculty were Monitoring Progress, Continuous Communication, and Ongoing Support/Coaching and Training. These interventions are key actions required of change facilitators that lead to successful implementation of educational change. The findings suggest that, just as faculty members require new knowledge and skills to integrate the MET into their own teaching practices, so do change facilitators require professional development and support for their role. It may also be important in systemic change to have skilled individuals to monitor the work of the change facilitators, providing them with additional learning and support.

Therefore, the results of the study are congruent with Hall and Hord's view (2001) that mandated change may be successful if it is accompanied by continuing communication, ongoing training, on-site coaching, sufficient time for implementation and by change facilitators who are responsive to the concerns and personal needs of faculty. The present study highlights the importance of the leader change facilitator and underscores the need to prepare, train and support change facilitators in their role of providing continuing communication, ongoing training, on-site coaching interventions as required by participant concerns.

The study results underscore the important of facilitator interventions to be tightly coupled and responsive to the needs and personal concerns of faculty who are attempting to change their instructional practices. Change facilitators may also use the CBAM (Concerns Based Adoption Model) Stages of Concern as an indicator of implementation progress. By developing a better understanding of the level and types of concerns of their faculty, the change facilitators may then develop more responsive and effective interventions in helping their faculty.

Regarding other facilitative leadership interventions, the study results suggest that faculty perceived Planning, Providing Resources, and Organizational Arrangements as important/helpful factors. These change facilitators/leadership intervention factors are in alignment with critical variables for successful change identified by Hall and Hord (2001), and Fuller (1969).

Interestingly, specific facilitators and barriers in implementing educational innovations appear to have a close relationship with the CBAM framework.

Among the most important facilitators and barriers in implementing the MET as perceived by the faculty were the institutional change culture, ongoing support and training, and support shortcomings which are closely related to key actions of ongoing training and on-site coaching indicated in Hall & Hord's theory of mandated change (2001).

Implications for Future Research

Research describing the successful implementation of large-scale, system-wide educational change is needed (Hallinger & Eduards, 1992, p. 132), particularly research that focuses on the bigger picture and addresses the "whole of the organization" in a systems approach (Osborn & Cohran, 1992, p. 15). Research on organizations involved in systemic change can provide a deeper level of understanding of the processes and factors that determine successful implementation of the transformation process.

The ITESM initiative currently in progress provides a unique environment in which to study and better understand the faculty perceptions and experiences of the educational change processes, and to identify the perceived barriers and drivers of change within a higher education system. To fully understand the change process, similar focus on the perceptions and experiences of other parties to the process (e.g. administrators and students) is clearly needed. However, this initial focus on faculty is the first step in the process. Thus, the ITESM case may provide important information to other campus of the ITESM system and other institutions by means of a longitudinal study of the change process.

The implementation of the MET was mandated. A continued effort to monitor the mandated change process at ITESM can be helpful in understanding the extent to which change is achieved and how leadership intervention strategies help or slow down the change process. This study provides clues to additional areas for further research including:

a) Conducting a similar study of faculty concerns and perceptions of systemic change in other campus of the ITESM system. Such a study may also rely on quantitative research methods supported by survey research to conveniently collect data from faculty in other campus. The same Likert-type perception instruments of facilitators, barriers and leadership interventions may be used once again as were tested and validated by Resta, González, Menchaca and Porres (2003). Future use and ongoing work on the instruments to obtain reliabilities higher than 0.8 for few factors may be an important implication for further research.

b) Planning a follow-up study to determine the impact of additional ongoing training and multi-year implementation support provided in the framework of professional learning communities, and examining the best teaching-learning practices to bolster the community's academic environment and ways to support the change process among faculty.

c) Undertaking a study to examine in depth the facilitation effects of leadership interventions conducted by academic administrators in implementing new ways of teaching and learning. These administrative leadership interventions should be guided by the current concerns of faculty during the educational change efforts. In addition, there is need to develop a better understanding of faculty perceptions of facilitators, barriers, and successful leadership interventions in the systemic change process at different stages of concern in the adoption of the new teaching-learning strategies.

d) Examining multiple-repeated measures of 21st century student skills in order to assess individual change and determine the effectiveness of the different teaching and learning strategies employed in redesigned courses in which students have participated.

e) Undertaking a study to assess students' perceptions of the MET and their adaptation to new ways of teaching and learning.

f) Preparing a study to determine the perception of current employers of ITESM graduates to determine their perception of the skills of ITESM graduates who were fully exposed to new ways of teaching and learning while receiving undergraduate education at ITESM. The results from this effort will assist in achieving a better understanding of what works for the field of employment and what does not, and will facilitate the development of enhanced educational environments for current and future students.

g) Completing a study to identify the lessons learned and best practices for achieving the transformation of educational practices of different stakeholders. For example, faculty may have different perspectives of what facilitates and/or inhibits the adoption of educational innovations than do administrators, students, parents or staff.

These and other inquiry issues require the design and implementation of additional and more comprehensive research efforts encompassing a broader range of variables, in order to better understand the educational change process and its effects on faculty, students, administrators, staff, and employers.

Implications for Practice

Few institutions of higher education have launched a system-wide implementation of a systemic change of the teaching-learning paradigm. Systemic change in any context is never easy and there are relatively few models of the successful transformation of the teaching and learning process within an entire higher education institution. Based on the long academic traditions of universities, a mandated system change strategy in higher education represents a particularly difficult process requiring that the leadership strike a careful balance between academic freedom and academic performance expectations.

The knowledge to be gleaned from the ITESM experience will be important to share with other institutions of higher learning contemplating similar initiatives. Research has found that educational innovation and change efforts are extremely challenging, and require a minimum period of time (several years) to achieve effectiveness. According to Hall and Hord (1998) implementation takes time and often, during the first or second year of implementation, participants (e.g., faculty, students, and staff) may reach the wrong conclusion that the new approach does not work, when in fact there was not enough time and/or support for the change implementation process. It should be recognized, that the change process is still underway and represents a "moving target" that needs to be carefully addressed in the next few years as the redesigned teaching-learning process becomes increasingly consolidated and integrated into the fabric and culture of the institution.

This project contributed to deeper levels of understanding of the needs, challenges, and effects of a systemic change process in higher education. In addition, the study helped to identify the effectiveness of system change interventions, including professional development and support strategies designed to assist faculty at each stage of the change process. Based on the results and findings, there are some important actions to be considered by academic administrators at the Mexico City campus and at the system level. These actions include: (1) sharing results of this study with faculty, administrators and staff on the Mexico City campus and other ITESM campuses and making appropriate adjustments in different aspects of the MET implementation process; (2) conducting specific professional development interventions for academic administrators to better prepare them as change facilitators; (3) redefining the scope and focus of the part-time faculty group within the MET implementation process; (4) reorienting the system of incentives and rewards to better stimulate faculty involvement and achievement across different stages of implementation; (5) providing results and findings of this study to help in developing new educational paradigms at ITESM.

For academic administrators, the process of systemic educational change represented a unique and daring effort to achieve an extraordinary transformation of the learning environment. The administrators' greatest challenges in such an undertaking are to provide resources to support the change process, aligning administrative procedures to the new practices, and to create the strong community environment necessary to mentor and provide multi-year support for faculty, administrators and students.

It was anticipated that the results of this study might help ITESM conduct a formal, system-wide research-based evaluation of the implementation of the MET since the mandated change was declared and the mission was set in place in 1996. It was also anticipated that the results of the study might prove useful to other institutions of higher education in the U.S. and other countries that acknowledge the need for changing traditional teaching-learning approaches, and are, therefore, interested in initiating similar efforts. It will also represent an important contribution to understanding the conditions under which mandated systemic change in higher education may be effective.

LIMITATIONS AND SIGNIFICANCE OF THE STUDY

This study examined faculty concerns and perceptions of facilitators, barriers, and leadership interventions in implementing the MET. Although the entire ITESM System is experiencing system-wide systemic educational change, this research was conducted as an exploratory study at the second largest component institution of the ITESM System—the Mexico City campus—and involved the participation of full-time and part-time faculty from the high-school and undergraduate educational levels. Focusing on faculty from one large urban campus, the researcher was able to collect information using various questionnaires from a large and diverse number of professors. The study relied largely on quantitative research methods supported by survey research and different statistical methods.

Despite the high number of participants in the study (333 faculty members), results from data collection may not be generalized to the broad population of ITESM faculty in other campus, as they were collected from volunteer participants who may or may not represent the complete spectrum of adoption of the ITESM Educational Model.

There were some internal and external threats to the validity of the study. Selection biases resulting from the differential self-selection of the subjects for the comparison groups is a threat to the internal validity of the survey data. A threat to the external validity of the study was the potential reactive effects of testing, consequently limiting the study's generalization. Participation in the study was strictly voluntary, and the Web-based survey form for collecting data was designed to provide anonymity to participant responses. The data's validity may be threatened by the number of faculty who refused to participate in the survey. People who refused to participate were potentially able to introduce systematic bias errors that threaten the validity of generalizations that can be applied to the population studied by a survey. Jaeger (1988) indicated that inappropriate and inadequate sampling is present when the survey is not conducted according to design. High rates of non-response can lead to substantial bias error (Jaeger, 1988,

p. 325). Fitzgerald and Fuller (1982) also examined the effects of refusers and reluctant responders on survey estimates of population distributions, and found that refusers are not merely a simple, random sample.

There is a possibility that participants may have felt threatened by the content dimensions of the data collection instruments, and the responses provided may have been those considered to be socially acceptable. Together with the subjects' differential self-selection, the potential generalization of the study to other ITESM campuses implementing the MET might be limited.

Relevant campus-level and system-level information was used to provide a better understanding of the context of this exploratory study, and to identify and examine possible issues, barriers, facilitators, and administrative leadership interventions. Specifically, qualitative data collected in the systemic educational change process prior to conducting this research was used to construct and validate Likert-type perception instruments of facilitators, barriers and leadership interventions in the implementation of the MET. The scales for perceptions of facilitators and barriers were constructed for the purpose of this study, and the scale for leadership interventions was expanded and adapted for the same purpose. A pilot test was conducted to validate these instruments during the UT-ITESM Summer 2003 Institute, with the participation of 50 subjects from different ITESM campuses. It remains to be examined if similar results are obtained with a random sample, or with other surveys conducted periodically on other campuses.

Despite the limitations indicated above, it is expected that the results of this study may be at least partially generalized to other similar campuses (e.g., the large urban campuses in Monterrey, Toluca, Santa Fe, Querétaro, and Guadalajara) within the ITESM system in Mexico. This is due to the shared institutional culture, norms, academic policies, and professional development common to all component institutions of ITESM. In addition, other institutions of higher education embracing systemic educational changes might use the information generated by this study as a reference.

The ITESM case provides a unique opportunity to examine what institutions can do to address the needs of different stakeholders in institution-wide, mandated educational change. Higher education administrators need to know how to lead the adoption of innovative ways of teaching and learning using educational technology. Based on prior research on educational systemic change, differences between faculty's perceptions of what facilitates or obstructs the adoption of an educational innovation were anticipated at different stages of the implementation. Also, it was expected that the faculty's personal concerns would vary across the different stages of implementation when individual characteristics are considered.

SUMMARY

Higher education is undergoing a fundamental transformation, from the Middle Ages and the Industrial Age to the Information Age, in order to meet new and increasing demands from a fast-changing society. Although Information Technology (IT) has brought about many opportunities to enhance student learning, university professors need help in transitioning from roles as information transmitters to roles as facilitators of learning. This transformation has evolved into new educational paradigms seeking to convert colleges and universities from institutions that provide instruction to institutions that produce learning.

ITESM is among the first institutions of higher education to recognize the need to incorporate new learning approaches into classroom instruction throughout an entire multi-campus system. The decision to initiate such a change effort represented a massive challenge for a higher education system as large and as geographically distributed as ITESM. Based on the needs expressed by stakeholders a new vision of the teaching-learning process was developed, and a new mission statement was adopted by the entire system. The new vision called for the ITESM system to create new learning environments that incorporated twenty-first century pedagogies and the use of technology into the teaching-learning process.

ITESM recognized that the most essential condition for system-wide change of the teaching-learning process was that of faculty development. It therefore initiated an unprecedented and massive faculty development effort to enable faculty to develop the skills and knowledge to effectively use the new pedagogical strategies in their instruction. A formal, sequential program of professional development for faculty was developed that spans a multi-year period and includes certification upon completion of the program.

This research was conducted as an exploratory study and focused on faculty concerns and perceptions of facilitators, barriers, and administrative leadership interventions in implementing a mandated systemic educational change to the teaching-learning process at the Mexico City campus of the ITESM system. Based on the data analysis and obtained results, the most important factors in implementing the MET as perceived by the faculty were: (a) **Facilitators**: Students acceptance of change, institutional change culture, faculty academic background, and ongoing support & training; (b) **Barriers**: Support shortcomings and infrastructure operational problems; (c) **Leadership Interventions**: Providing resources and arrangements, ongoing support/coaching, and supportive change culture.

Based on the major findings and supporting literature for the three research questions, the researcher identified that the most important individual characteristics of faculty in implementing the ITESM Educational Model were **work status** (part-time or full-time) and **professional development/MET implementation level** (non-user, inexperienced user, experienced user, experienced-advanced user, or renewing user). Most faculty concerns and perceptions of facilitators, barriers and leadership interventions in implementing the MET can be explained by whether the faculty member was full-time of part-time. Full-time professors were more closely related to the ITESM institutional culture, were highly exposed to the institutional systemic change process, were closer to *change facilitator* leaders, and were usually more involved in and committed to participating in the change process as compared with part-time professors. Most faculty concerns and perceptions of facilitators, barriers, and leadership interventions could be explained by the faculty members' professional development across the multi-stage adoption process of the MET. There were many part-time faculty members with time limitations, less involvement with the institution, and with fewer opportunities for participation in the Faculty Development of Teaching Skills (FDTS) program. Therefore, work status and professional development were closely related in the MET implementation process because the professional development path of faculty members at the Mexico City campus depended on whether they were full-time or part-time.

Initiating a mandated redesign of the ITESM teaching-learning process was a high-risk decision. Contributing to the development of individuals with a deep knowledge in their academic field and with desired specific attributes represents a major institutional effort. In the end, however, the outcome of this multi-year educational project will rely primarily on the faculty's commitment to the new teaching-learning approach and the necessary administrative support. A system-wide paradigm shift in the teaching-learning process represents a massive challenge and will be successful only through a combination of effective change strategies, professional development, facilitative leadership and ongoing support.

For high-level administrators in charge of implementing institutional change, it is important to be aware of the varying barriers, facilitators and leadership interventions in order to successfully lead the change process in higher education. It is hoped that this study may prove a useful resource to them in such an undertaking.

Appendix A

FORM A1: SOCQ PERMISSION LETTER

SOUTHWEST EDUCATIONAL
SEDL
DEVELOPMENT LABORATORY
Building Knowledge to Support Learning

211 East Seventh Street Austin, Texas 78701 Voice: 512/476-6861 Fax:512/476-2286

TO: Enrique Gonzalez (Licensee)

FROM: Joyce S. Pollard, Ed.D.
Director, Office of Institutional Communications

SUBJECT: Permission to reprint and distribute SEDL materials

DATE: November 24, 2004

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Please sign below, indicating that you understand and agree to comply with the above terms, conditions and limitations, and send the original back to us. If you wish, you may keep a duplicate of this agreement, but the copy with your original signature needs to be returned to us. Thank you again for your interest in SEDL's materials. If you have questions, please contact me at (800) 476-6861.

Sincerely,

Joyce Pollard by Arnold W. Kriegel
For Southwest Educational Laboratory

Agreed and accepted:

Signature: _______ Printed Name: ENRIQUE GONZALEZ NEGRETE

Date signed: November 24, 2004

FORM A2: CO-CHAIRS FACULTY INVITATION LETTER

July 7, 2003
Austin, Texas

Dear ITESM Faculty,

The Monterrey Institute of Technology and Higher Education (ITESM) initiative represents a unique effort globally to systemically transform the teaching and learning process and change the educational paradigm of the university. The ITESM educational model is designed to create a student-centered, technology-assisted learning environment based on current research on human learning and educational philosophies such as constructivism. Other universities in many parts of the globe are initiating piecemeal efforts toward changing the educational paradigm within their institutions. The experience and knowledge gained from the ITESM initiative will be of enormous benefit to them as well as many other higher education institutions considering similar efforts.

It is particularly important to understand the faculty experience in the educational change process. One of our doctoral dissertation students, Carlos Enrique Gonzalez, is focusing his efforts in understanding the change process at ITESM-Mexico City. We are inviting you to participate in the important study he is conducting. The knowledge that will be acquired will be helpful to other institutions of higher learning and to ITESM in understanding and being more responsive to faculty needs.

Mr. González's exploratory study focuses on faculty concerns and perceptions about mandated educational change in the ITESM Mexico City Campus. The scope of the study includes the high school and undergraduate levels. The study is designed to provide anonymity of responses to the participants in accordance to the University of Texas at Austin's Institutional Review Board (IRB) standards on research with human subjects.

The surveys you are invited to fill out will be submitted to the University of Texas website. The dissertation committee co-chairs (listed below) and a research assistant under their direction will create a separate data base in which personal identification information will be protected. The researcher, Carlos Enrique Gonzalez, will only have access to the data after a separate ID is created to protect the identity of each subject in the study. Participation in this study is strictly voluntary and failure to participate will not adversely affect your current status or future position in ITESM Mexico City Campus.

The electronic surveys have been designed using a Web-based environment. To answer the questionnaires, please access the following URL address: http://student.edb.utexas.edu/itesm/2003/ccm2003.html. The required password is: **ccm2003.**

At the end of the study, a summary will be provided to the interested participants. Again, we invite you to participate in this important study about the faculty's experience on the implementation of the ITESM educational model.

Sincerely,

Dr. Paul E. Resta
resta@mail.utexas.edu
The University of Texas at Austin
Learning Technology Center
1 University Station Stop D5900

Dr. James P. Duncan
j.duncan@mail.utexas.edu
The University of Texas at Austin
Higher Education Administration
1 University Station Stop D5900

Form A3: Faculty Invitation Letter

Mexico City - July 7th, 2003

Dear Faculty,

I hope the upcoming fall semester positively fulfills your academic interests. One of my personal priorities for this period is to closely overlook the implementation of ITESM Educational Model) in the Mexico City Campus. While doing so, I would also like to work on my doctoral dissertation; specifically working on data collection. Therefore, I will like to share with you my research project titled: *Faculty concerns and perceptions about mandated educational change: An Exploratory Study*. I will also like to invite you to participate in the study I am conducting. Particularly, I would appreciate your help in filling out an electronic survey in order to collect data for the study. Data collected through these surveys will help us understand the faculty experience in the implementation of the ITESM Educational Model. Next, I will briefly describe the context of the research.

As a response to new and growing demands in Mexico, the Monterrey Institute of Technology and Higher Education (ITESM) redefined its mission statement in 1995. ITESM mission seeks to educate individuals committed to the social, economic, and political development of Mexico; and to become internationally competitive in their academic field. In order to fulfill this mission, ITESM main strategy became the redefinition of its teaching-learning process.

The Monterrey Institute of Technology and Higher Education (ITESM) initiative represents a unique effort to systemically transform the teaching and learning process and change the educational paradigm of the institution. ITESM's educational model is designed to create a student-centered, technology-assisted learning environment in order to educate individuals that become contributing members of the society.

As a researcher, I have found few examples of large scale, high intensity, well documented, and sustained faculty development as part of a strategy to systemically change the teaching-learning process within large institutions of higher education. The process of systemic change at ITESM is a unique example of an institution that has been recognized internationally for its ongoing effort to mandate and support change of the teaching-learning process throughout the entire system of 33 campus. Therefore, it is important to understand the faculty experience in the change process; particularly to understand the faculty concerns and perceptions of barriers and facilitators to implement the ITESM Educational Model.

As mentioned earlier, I am currently working on my dissertation. The University of Texas at Austin doctoral program in higher education administration has helped me to better understand the nature and complexities of institutions of higher learning. Accordingly, I decided to work with my dissertation's co-chairs – Dr. Paul Resta and Dr. James Duncan – on a case study. This research intends to understand the change process at the ITESM Mexico City Campus; the institution I have been working for since 1995.

My dissertation is an exploratory study on faculty concerns and perceptions of mandated educational change. The research study is focused on the experience of full-time and part-time faculty in implementing the ITESM educational paradigm within the high-school and undergraduate levels. I extend to you an invitation to participate in this study. The knowledge that we will acquire will be helpful to ITESM in understanding and being more responsive to faculty needs.

The study requires me to collect data from a representative sample of our institution. I am looking for the voluntary participation of 250 subjects in completing the three sections of a Web-based survey. The study is designed to provide anonymity of responses to the participants in accordance to the UT Austin's Institutional Review Board (IRB) standards on research with human subjects.

As indicated in the attached letter from Dr. Paul Resta and Dr. James Duncan, these surveys will be submitted to the University of Texas website. Both co-chairs and a research assistant under their direction will create a separate data base in which personal identification information will be protected. However, your name will not be requested to complete the survey. I will only have access to the data after a separate ID is created to protect the identity of each subject in the study. Participation in this study is strictly voluntary and failure to participate will not adversely affect your current status or future position in ITESM Mexico City.

Also attached is the Consent Form I am asking you to read if willing to participate in the study. To indicate you have read the information in this form and have decided to participate, please access the following URL address: http://student.edb.utexas.edu/itesm/2003/ccm2003.html and complete the survey. The required password is: **ccm2003.**

Upon completion of the study, a summary will be provided to the interested participants. I am sure your participation will enhance ITESM's academic agenda. Finally, I would like to thank you for your participation and for your commitment to build a stronger Mexico.

Sincerely,

Carlos Enrique González N.
President
ITESM-Mexico City

Appendix B

QUESTIONNAIRE 1

GENERAL DEMOGRAPHIC INFORMATION

1. Age 20-24____ 25-29 ____ 30-34 ____ 35-39 ____

40-44____ 45-49 ____ 50-54____ 55-or more____

2. Gender Male____ Female____

3. Education Level BA____ MA____ PhD___

4. Academic Division

High School ____ Business____ Engineering____ Humanities & Social Sciences ____

5. Work Status

Full Time____ Part Time____ Part Time with Full Time Staff Duties____

6. Years teaching at ITESM ____

7. Years of teaching experience____

8. Hours of professional development in the ITESM Educational Model ____

9. Professional development program stage 1_____2_____3____ 4_____

10. Percent of advancement in the stage of the professional development program you are currently participating _____%

11. Are you applying a didactic technique in your course? Yes____No____

12. Which didactic technique(s)?

Collaborative Learning Yes____No____

Problem Based Learning Yes____No____

Project Oriented Learning Yes____No____

Case Studies Yes____No____

13. Are you a facilitator of a didactic technique? Yes____No____,

14. Are you in the facilitator certification process?

I am a certified facilitator ____

I am not in the certification process as facilitator ____

15. If you are a facilitator in which didactic technique are you a facilitator:

Collaborative Learning	Yes____No____
Problem Based Learning	Yes____No____
Project Oriented Learning	Yes____No____
Case Studies	Yes____No____

QUESTIONNAIRE 2

STAGES OF CONCERN ON THE ADOPTION OF THE ITESM EDUCATIONAL MODEL

The purpose of this questionnaire is to determine present concerns of those involved in the process of implementing or thinking about implementing the ITESM Educational Model at various times during the innovation adoption process. The items were developed from typical responses of school and college teachers, who ranged from no knowledge at all about various programs to many years experience in using them. Therefore, a good part of the items on this questionnaire may appear to be little relevance or irrelevant to you at this time.

For the completely irrelevant items, please select "0" on the scale. Other items will represent those concerns you do have, in varying degrees of intensity, and should be marked higher on the scale, according to the explanation next to the numbers. Mark other items from 1 to 7, with 1 representing statements that are not at all true of you at this time, and 7 representing statements that are very true of you at this time.

For example:

This statement is very true of me at this time.

0 1 2 3 4 5 6 **7**

This statement is somewhat true of me now.

0 1 2 3 **4** 5 6 7

This statement is not at all true of me at this time.

0 1 **2** 3 4 5 6 7

This statement is irrelevant to me.

0 1 2 3 4 5 6 7

Please respond to the items in terms of your present concerns, or how you feel about your involvement or potential involvement with the ITESM Educational Model; a student-centered technology-assisted teaching and learning process.

Remember to respond to each item in terms of your present concerns about your involvement or potential involvement with the ITESM Educational Model; a student-centered technology-assisted teaching and learning process.

Thank you for taking time to complete this task.

Irrelevant	0
Not true of me now	1
Somewhat true of me now	4
Very true of me now	7

1. I am concerned about students' attitudes toward the ITESM Educational Model.

2. I now know of some other approaches that might work better.

3. I don't even know what the ITESM Educational Model is.

4. I am concerned about not having enough time to organize myself each day.

5. I would like to help other faculty in their use of the ITESM Educational Model.

6. I have a very limited knowledge about the ITESM Educational Model.

7. I would like to know the effect of ITESM educational innovation on my professional status.

8. I am concerned about conflicts between my interests and my responsibilities.

9. I am concerned about revising my use of the ITESM Educational Model.

10. I would like to develop working relationships with both our faculty and outside faculty using the ITESM Educational Model.

11. I am concerned about how the ITESM Educational Model affects students.

12. I am not concerned about the ITESM Educational Model.

13. I would like to know who will make the decisions in this new educational system.

14. I would like to discuss the possibility of using the ITESM Educational Model.

15. I would like to know what resources are available if we decide to adopt the ITESM Educational Model.

16. I am concerned about my inability to manage all the ITESM Educational Model requires.

17. I would like to know how my teaching or administration is supposed to change.

18. I would like to familiarize other departments or persons with the progress of this new educational approach.

19. I am concerned about evaluating my impact on students.

20. I would like to revise the ITESM Educational Model's instructional approach.

21. I am completely occupied with other things.

22. I would like to modify our use of the ITESM Educational Model based on the experiences of our students.

23. Although I don't know about the ITESM Educational Model, I am concerned about other things in the area.

24. I would like to excite my students about their part in this educational approach.

25. I am concerned about time spent working with non-academic problems related to the ITESM Educational Model.

26. I would like to know what the use of the ITESM Educational Model will require in the immediate future.

27. I would like to coordinate my efforts with others to maximize the ITESM Educational Model's effects.

28. I would like to have more information on time and energy commitments required by this ITESM Educational Model.

29. I would like to know what other faculty are doing in this educational innovation.

30. At this time, I am not interested in learning about the ITESM Educational Model.

31. I would like to determine how to supplement, enhance, or replace the ITESM Educational Model.

32. I would like to use feedback from students to change the implementation of the ITESM Educational Model.

33. I would like to know how my role will change when I am using the ITESM Educational Model.

34. Coordination of tasks and people is taking too much of my time.

35. I would like to know how this ITESM Educational Model is better than traditional ways of teaching and learning.

36. What other concerns, if any do you have at this time? (Please describe them using complete sentences.).

QUESTIONNAIRE 3

FACILITATORS OF THE IMPLEMENTATION OF THE ITESM EDUCATIONAL MODEL (Menchaca, Resta, González, and Porres, 2004)

This questionnaire will help us understand faculty perceptions of what has facilitated the implementation of the ITESM Educational Model (i.e., MET).

Remember: There are no right or wrong answers.

The questionnaire makes reference to facilitators as the conditions that have supported the appropriate implementation of the **ITESM Educational Model**.

For each sentence describe your perception in regard to:

How much have the following factors been a facilitator in the implementation of the ITESM Educational Model (i.e., MET):

___1) None ___2) A little bit ___3) Some ___4) A lot ___5) Very Much

Facilitators

How much each factor has facilitated the implementation of the ITESM Educational Model.....

_____1. Having access to Information Technology.

_____2. Classrooms' conditions for the MET (equipment and furniture).

_____3. Appropriate work spaces for faculty (offices and meeting rooms)

_____4. Having access to the ITESM Digital Library.

_____5. The philosophy of the institution.

_____6. The change culture of the institution.

_____7. Collegiate work in system-wide academies.

______8. The organizational structure of the institution.

______9. Collegiate work in local academic departments.

______10. The strategic alliances with foreign leading universities in the educational technology field.

______11. Support from other faculty members who have experience and understanding of the ITESM Educational Model.

______12. ITESM top officials' vision of needed educational change.

______13. ITESM directors' willingness to accept the risks of innovation.

______14. The support of the schools' deans.

______15. The compromise from the academic departments' chairs.

______16. The compromise from support areas directors.

______17. The support from degree program directors.

______18. The commitment of the campus president.

______19. The support of the academic development director.

______20. The coordination between the academic administrators and the director of academic development.

______21. The information flow within the institution.

______22. Having access to different channels of communication.

______23. Having available institutional information.

______24. Having educational experiences' exchanges.

______25. The prestige of the institution.

______26. Having economic incentives.

______27. The institutional feedback system.

______28. Having certified faculty members on ITESM Faculty Development Program.

______29. Having available redesigned-courses approved at the system level.

______30. Having available ITESM redesigned-model courses.

______31. The focus on disciplines supported by specific didactic techniques (PBL, POL, CL, CS)

______32. The availability and application of didactic techniques

How much each factor has facilitated the implementation the MET.....

_____33. Having standard and unified criteria for all courses offered by each department.

______34. Counting on A and B levels of ITESM Program for the Development of Teaching Skills (PDTS)

______35. The institutional support for professional development.

______36. ITESM continuous professional development program.

______37. Having local professional development policies

______38. Having professional development seminars in didactic techniques at foreign universities (UT Austin, U. of Maastrich, Twente U., etc).

______39. The shortened versions (decreased hours) of ITESM Professional Development courses.

______40. The certification of academic administrators (deans, department chairs and program heads).

_____41. Having a unified vision of the MET throughout professional development.

_____42. Having professional development on the use of educational technology.

_____43. Having professional development follow up from department chairs.

_____44. The adoption of high-quality courses certified at the system level.

_____45. The possibility of making adjustments to previously redesigned courses.

_____46. The possibility of selecting courses to be adopted at the system level.

_____47. The support from different administrative areas.

_____48. The support from pedagogical advisors.

_____49. The support from technological advisors.

_____50. The support from authors (faculty members) of redesigned courses.

_____51. Faculty's individual academic background.

How much each factor has facilitated the implementation the MET....

_____52. Years of teaching experience

_____53. The pedagogical design of the course.

_____54. The attitude toward change.

_____55. The faculty compromise with the institution.

_____56. Desire to participate in educational innovation.

_____57. Desire for self actualization.

_____58. The students' acceptance of educational change.

______59. The self regulation of the student's learning.

______60. Students' trusted participation in the educational change.

______61. Faculty-student interaction outside the classroom.

______62. Students' acceptance of using technology.

Questionnaire 4

Barriers for the Implementation of the ITESM Educational Model
(Menchaca, Resta, González, and Porres, 2004)

This questionnaire will help us understand faculty perceptions of what has obstructed the implementation of the ITESM Educational Model.

Remember: There are no right or wrong answers.

The questionnaire presents barriers as the conditions that have obstructed the appropriate implementation of the **ITESM Educational Model**.

For each sentence describe your perception in regard to:

How much have the following factors been a barrier in the implementation of the ITESM Educational Model (i.e., MET):

___1) None ___2) A little bit ___3) Some ___4) A lot ___5) Very Much

Barriers

How much have the following factors been a barrier in the implementation of the MET…

_____1. Decisions are made at upper levels without considering opinions of people involved in the process.

_____2. The centralized decision making process.

_____3. Academic administrators do not facilitate decisions they make.

_____4. Differences in the vision of the ITESM Educational Model between academic administrators and faculty.

_____5. Frequent changes in the direction of the ITESM Educational Model during the implementation period.

_____6. Need for more clarity in the direction in which we are leading the students.

______7. Lack of collaboration between academic units and support areas.

______8. Actions of academic administrators don’t reflect the same level of commitment to the ITESM Educational Model, compared to expected commitment from faculty.

______9. Lack of faculty collaborative work.

______10. Lack of trust and openness between academic administrators and faculty.

______11. Characteristics of faculty physical spaces (offices and meeting rooms) do not help collaborative work.

______12. Faculty communication.

______13. Lack of discussion of educational problems and experiences exchange in the implementation of the ITESM Educational Model.

______14. Lack of discussion of educational practices and their effects on students.

______15. Academic administrators do not share on time key information about the ITESM Educational Model’s effects on students.

______16. Academic administrators’ understanding of the ITESM Educational Model.

______17. Ambiguity between what the use of technology is, and what the ITESM Educational Model is.

______18. The way economic resources are assigned to implement the ITESM Educational Model.

______19. The lack of appropriate classrooms for redesigned courses.

______20. The lack of information technology infrastructure on campus.

______21. Group size.

______22. On-time maintenance of information technology infrastructure.

______23. Proper operation of technological platforms (Lotus Notes, Blackboard).

______24. Servers' operational failures (lack of accessibility or overloaded capacity).

______25. Rigid institutional norms and policies.

______26. Lack of alignment of administrative processes with the new teaching and learning process.

______27. Differences between the objectives of academic units and the objectives of administrative areas.

______28. Class sessions' schedules.

______29. Faculty teaching load.

______30. ITESM requirement to apply three partial exams and a final exam in each course.

______31. Faculty turnover.

______32. ITESM Educational Model support staff turnover.

______33. Lack of incentives to advance in the implementation of the ITESM Educational Model.

______34. Ambiguity in criteria for student evaluation.

______35. Increasing demands on faculty workload.

______36. Lack of updated curriculums.

______37. Lack of classroom monitoring to improve the implementation of the ITESM Educational Model.

______38. Lack of institutional evaluation of the ITESM Educational Model implementation.

______39. Individual advancement in the faculty professional development program.

______40. Training abroad on didactic techniques.

______41. Training offered by local instructors on campus.

______42. The professional development program's course schedules are inappropriate.

______43. Content of professional development courses.

______44. Lack of faculty pedagogical training.

______45. Follow up to the certification process of ITESM professional development program.

______46. Lack of support from the Learning Technology Center's technological and didactic advisors.

______47. Lack of support from facilitators previously certified in didactic techniques.

______48. Technological and didactic advisors' workload.

______49. Support deficiencies during the implementation process.

______50. Lack of time to become involved in the change process.

______51. The required time to understand the ITESM Educational Model.

______52. Lack of time for courses' continuous improvement.

______53. Lack of time for course follow up throughout virtual interaction with students.

______54. Lack of time for training in didactic techniques.

______55. Lack of time for continuous feedback during the implementation process.

______56. Lack of time for faculty interaction.

______57. Change's resistance to new educational paradigms.

______58. Other faculty's resistance to the new educational model.

______59. Difficulty for course' innovation.

______60. Skepticism about the effectiveness of the ITESM Educational Model.

______61. Difficulty to change the faculty's role of "sage in the stage" lecturer to a learning facilitator.

______62. Required use of didactic techniques in redesigned courses.

______63. Confusion caused by not understanding why to change.

______64. Thinking about technology as an obstacle for student learning.

______65. Students' acceptance of his/her new active role in this new teaching-learning process.

______66. Student's low level compromise with his/her own learning.

______67. Lack of student's self discipline demanded by the ITESM Educational Model.

______68. Students' apathy towards redesigned courses.

______69. Lack of students' learning habits adaptation to the new educational model.

______70. Lack of students' adaptation to work collaboratively.

______71. Students' perception of faculty teaching performance on redesigned courses.

QUESTIONNAIRE 5

ADMINISTRATIVE LEADERSHIP INTERVENTIONS TO FACILITATE CHANGE IN THE IMPLEMENTATION OF THE ITESM EDUCATIONAL MODEL (Menchaca, Resta, González, and Porres, 2004)

A first step in guiding change interventions is to know the concerns of the community members, especially their most intense concerns. The second step is to implement interventions that might respond to those concerns. The following list contains examples of interventions that might address faculty concerns. The list comes from the Concerns Based Adoption Model and has been adapted for higher education with permission from SEDL (2003).

This list contains actions ITESM academic administrators implemented to support educational change; or the implementation of the ITESM Educational Model (i.e., MET). Think about how helpful have your academic administrators' change- facilitation actions been for you.

Please tell us from your experience as ITESM professor: If academic administrators performed the following actions: How helpful they were to address your needs during the past academic year?

Remember: The ITESM Educational Model can be described as a student-centered, technology-assisted teaching and learning process.

The action to facilitate change was helpful during the past academic year.
0 – Action not evident to me 1 – Strongly Disagree 2 – Disagree
3 – Undecided 4 – Agree 5 – Strongly Agree

_____1. Technology infrastructure, including network, hardware, software, and systems administration, is in place.

_____2. Support for technology infrastructure is in place.

_____3. Time and project schedules are appropriately set in place.

_____4. A Learning Technology Center has been established to support faculty.

_____5. Academic administrators have allocated time resources for professional development.

_____6. Academic administrators have allocated economic resources to prepare and to support professional development.

_____7. Academic administrators have allocated economic resources to reward professional development.

_____8. Academic administrators have designated dedicated change facilitators.

_____9. The development of a professional learning community of support was sustained.

_____10. A professional learning community is built and is promoted for ongoing assistance and support.

_____11. A culture of innovation has been established in the ITESM system.

_____12. A culture of collaboration has been established in the ITESM system.

_____13. A culture of interconnection - interdependence has been established in the ITESM system.

_____14. Academic administrators are working towards shared leadership.

_____15. Academic administrators are working towards shared decision-making.

_____16. Administrative processes include the planning and understanding of didactic techniques of the ITESM Educational Model.

_____17. Administrative processes include the planning and understanding of learning activities of the ITESM Educational Model.

_____18. Time has been devoted to work on the acceptance and possible fears of new educational technology.

_____19. Time has been devoted to work on the acceptance and possible fears of new roles.

_____20. Monitoring is ongoing to assess progress and difficulties in adoption of the ITESM Educational Model.

______21. Data has been collected to measure the effects of the delivery of the ITESM educational model.

______22. Data has been analyzed to measure the effects of the delivery of the ITESM educational model.

______23. Feedback from formative evaluation results of the delivery of redesigned courses has been provided for ongoing improvement.

______24. Academic administrators provided clear and accurate information about the ITESM Educational Model.

______25. The faculty was involved in discussions about the ITESM Educational Model and its implementation.

______26. The faculty was involved in decisions about the ITESM Educational Model and its implementation.

______27. Faculty was encouraged to share information with colleagues who know about the ITESM Educational Model.

______28. Users of student-centered, technology assisted teaching and learning in other settings visited ITESM faculty.

______29. Information was shared in a variety of ways: verbally, in writing, and through any available media.

______30. Academic administrators communicated with individual professors.

______31. Academic administrators communicated with small and large groups of faculty.

______32. Academic administrators helped professors understand how the educational innovation relates to their current practices, both in regard to similarities and differences.

______33. Academic administrators used personal notes and conversations to provide encouragement.

______34. Faculty were able to legitimize the existence of personal concerns.

______35. Faculty were able to legitimize the expression of personal concerns, realizing these common concerns can be comforting.

______36. Faculty connected with others whose personal concerns had diminished and who were supportive.

______37. Academic administrators showed how the ITESM Educational Model could be implemented sequentially, rather than in one big leap.

______38. Academic administrators showed how important is to establish expectations that are attainable.

______39. Academic administrators clarified the steps and components of the ITESM Educational Model.

______40. Academic administrators provided answers addressing the small specific "how-to" issues that are so often the cause of management concerns.

______41. Academic administrators demonstrated exact and practical solutions to the logistical problems that contribute to management concerns.

______42. Academic administrators helped faculty sequence specific activities and set timelines for their accomplishments.

______43. Academic administrators attended to the immediate demands of the ITESM Educational Model, rather than possible future concerns.

______44. Faculty had opportunities to visit other settings where educational innovations similar to the ITESM Educational Model are in use.

______45. Faculty had opportunities to attend conferences related to educational innovations similar to the ITESM Educational Model.

______46. Concerns about the consequences of implementing the ITESM Educational Model were managed by positive feedback and support.

______47. Individuals who had concerns about consequences of implementing the ITESM Educational Model had opportunities to share their skills with others.

______48. Faculty received information pertaining to the ITESM Educational Model.

______49. Faculty had opportunities to develop those skills necessary for working collaboratively.

______50. Individuals, both within and outside the institution, who were interested in collaboration were brought together.

______51. Academic administrators helped faculty establish reasonable expectations and guidelines for collaborative efforts.

______52. Faculty provided technical assistance to others requiring assistance.

______53. Academic administrators encouraged faculty, but did not attempt to force collaboration on those who were not interested.

______54. Academic administrators respected and encouraged faculty interested in finding a better way.

______55. Academic administrators helped faculty channel their ideas and energies in ways that were productive rather than counterproductive.

______56. Faculty was encouraged to act on their concerns for program improvement.

______57. Academic administrators helped access resources faculty might need to refine their ideas and implement them.

______58. Academic administrators were aware of the fact faculty might replace or significantly modify the ITESM Educational Model.

______59. Academic administrators were willing to accept faculty might replace or significantly modify the ITESM Educational Model.

______60. Academic administrators provided an enthusiastic example of implementing the ITESM Educational Model.

Appendix C

Table C1. Facilitators Factor Analysis Pattern Matrix

Facilitators ML Promax	Factor					
	1	2	3	4	5	6
Students' trusted participation in educational change.	0.981					
Self regulation of the student's learning.	0.941					
Students' acceptance of educational change.	0.918					
Students' acceptance of using technology.	0.572					
Collegiate work in system-wide academies.		0.896				
Collegiate work in local academic departments.		0.797				
Organizational structure of the institution.		0.715				
Compromise from the academic departments' chairs.		0.353				
Appropriate work spaces for faculty.		0.250				
Possibility of courses adopted at the system level.			0.969			
Adoption of system level high-quality courses.			0.891			
Possibility of making adjustments to redesigned courses.			0.657			
Support from technological advisors.				1.013		
Support from pedagogical advisors.				0.874		
Having foreign universities professional development.				0.304		
Specific didactic techniques (PBL, POL, CL, CS) for disciplines.				0.287		
Philosophy of the institution.					0.931	
Change culture of the institution.					0.879	
Years of teaching experience.						0.926
Faculty's individual academic background.						0.651
Pedagogical design of the course.						0.498

Extraction Method: Maximum Likelihood. Rotation Method: Promax with Kaiser Normalization.

Table C2. Barriers Factor Analysis Pattern Matrix

Barriers 34 Items ML Oblimin	Factor							
	1	2	3	4	5	6	7	8
Lack of institutional evaluation of MET implement.	1.017							
Lack of classroom monitoring to improve MET.	0.791							
Decisions made upper levels.		1.016						
Centralized decision making process.		0.802						
Ambiguity between use of technology and MET.		0.238						
Lack of discussion of educational practices effects on students.		*						
Lack of students' new learning habits.			0.972					
Lack of students' adaptation to work collaboratively.			0.866					
Lack of student's self discipline demanded by the MET.			0.807					
Students' apathy towards redesigned courses.			0.757					
Proper operation of technological platforms.				0.910				
Servers operational failures.				0.897				
Maintenance of information technology infrastructure.				0.687				
Lack of appropriate classrooms for redesigned courses.				0.220				
Lack of T for courses' continuous improvement.					0.920			
Lack of T for virtual follow up and interaction with students.					0.770			
Time required to understand the MET.					0.620			
Lack of T for feedback during the implementation process.					0.595			
Lack of T to become involved in the change process.					0.534			

(table continues)

Barriers 34 Items ML Oblimin	Factor							
	1	2	3	4	5	6	7	8
Diff objectives academic units vs administrative areas.						0.884		
Lack of alignment of administrative processes with MET.						0.750		
AC AD' understanding of the MET.						0.507		
AC AD do not share key info MET's effects on students.						0.305		
Support deficiencies during the implementation process.							-0.908	
Technological and didactic advisors' workload.							-0.688	
Lack of support from the LTC advisors.							-0.686	
Training offered by local instructors on campus.							-0.417	
Lack of updated curriculums.							-0.299	
Difficulty to change the faculty's role .								0.738
Change's resistance to new educational paradigms.								0.668
Skepticism about the effectiveness of the MET.								0.650
Required use of didactic techniques in redesigned courses.								0.548
Difficulty for course' innovation.								0.532
Lack of faculty pedagogical training.								0.292

Extraction Method: Maximum Likelihood. Rotation Method: Oblimin with Kaiser Normalization.
* Loading under .2

Table C3. Leadership Interventions Factor Analysis Pattern Matrix

Leadership Interventions ML Promax	Factor					
	1	2	3	4	5	6
Ac Ad respected and encouraged faculty interested in finding a better way.	0.944					
Ac Ad helped faculty channel their ideas and energies in ways that were productive rather than counterproductive.	0.904					
Ac Ad encouraged faculty, but did not attempt to force collaboration on those who were not interested.	0.791					
Faculty was encouraged to act on their concerns for program improvement.	0.745					
Ac Ad were aware of the fact faculty might replace or significantly modify the MET.	0.621					
Faculty was involved in discussions about the MET and its implementation.	0.289					
Ac Ad communicated with small and large groups of faculty.		0.934				
Ac Ad helped professors understand how educational innovation relates to current practices.		0.838				
Ac Ad used personal notes and conversations to provide encouragement.		0.737				
Ac Ad communicated with individual professors.		0.619				
Data analyzed to measure effects of MET delivery.			1.010			
Data collected to measure the effects of MET delivery.			0.959			
Feedback from formative eval results of the delivery of redesigned course provided for ongoing improvement.			0.638			
Culture of collaboration established.				0.893		
Culture of interconnection - interdependence established.				0.805		
Culture of innovation established.				0.788		
Technology infrastructure is in place.					0.910	
Support for technology infrastructure is in place.					0.910	

(table continues)

Leadership Interventions ML Promax	Factor					
	1	2	3	4	5	6
Time and project schedules are appropriately set in place.					0.513	
Time has been devoted to work on the acceptance and possible fears of new roles.						1.027
Time has been devoted to work on the acceptance and possible fears of new technologies.						0.871
Ac Ad have allocated economic resources to reward professional development.						0.401
Faculty had opportunities to visit other settings where educational innovations similar to the MET are in use.						0.246

Extraction Method: Maximum Likelihood. Rotation Method: Promax with Kaiser Normalization.

Appendix D

Table D1. Facilitator Descriptive Statistics

Facilitator Factors	N	Range	Min.	Max.	Mean	Std. Deviation
Students' Acceptance of Change	257	4.00	1.00	5.00	3.4056	1.01579
Adoption/ Adaptation of Courses	257	4.00	1.00	5.00	3.2808	1.15261
Institutional Change Culture	258	4.00	1.00	5.00	3.8295	1.00096
Ongoing Support and Training	257	4.00	1.00	5.00	3.2464	0.96769
Faculty Academic Background	257	4.00	1.00	5.00	3.5175	0.95687
Professional Learning Community	257	4.00	1.00	5.00	3.0298	0.94167
Valid N (listwise)	257					

Table D2. Facilitator Multivariate Tests

Effect	Wilk's Lambda Value	F	Hypothesis df	Error df	Sig.	Partial Eta. ^{2}	Observed Power (a)
Intercept	0.190	100.936 (b)	6.000	142.000	0.000	0.810	1.000
EMPLOYRR	0.936	1.614(b)	6.000	142.000	0.147	0.064	0.605
DIVISAR	0.883	1.002	18.000	402.122	0.456	0.041	0.687
YRSITRR	0.854	1.286	18.000	402.122	0.193	0.051	0.822
FDPUSE5N	0.738	1.882	24.000	496.589	**0.007**	0.073	0.977
EDUCRDOC	0.984	0.378(b)	6.000	142.000	0.892	0.016	0.156
GENDERR	0.943	1.439(b)	6.000	142.000	0.204	0.057	0.547
EMPLOYRR * DIVISAR	0.889	0.946	18.000	402.122	0.522	0.038	0.654
EMPLOYRR * YRSITRR	0.840	1.419	18.000	402.122	0.118	0.056	0.867
EMPLOYRR * FDPUSE5N	0.789	1.458	24.000	496.589	**0.075**	0.058	0.917
EMPLOYRR * EDUCRDOC	0.880	3.226(b)	6.000	142.000	**0.005**	0.120	0.919
EMPLOYRR * GENDERR	0.932	1.740(b)	6.000	142.000	0.116	0.068	0.643
DIVISAR * YRSITRR	0.630	1.278	54.000	728.655	**0.092**	0.074	0.988
DIVISAR * FDPUSE5N	0.607	1.040	72.000	778.368	0.393	0.080	0.991
DIVISAR * EDUCRDOC	0.879	1.043	18.000	402.122	0.410	0.042	0.709
DIVISAR * GENDERR	0.893	0.911	18.000	402.122	0.566	0.037	0.632
YRSITRR * FDPUSE5N	0.563	1.204	72.000	778.368	0.127	0.091	0.998
YRSITRR * EDUCRDOC	0.832	1.497	18.000	402.122	**0.087**	0.059	0.889
YRSITRR * GENDERR	0.865	1.172	18.000	402.122	0.281	0.047	0.774
FDPUSE5N * EDUCRDOC	0.797	1.394	24.000	496.589	0.102	0.055	0.901
FDPUSE5N * GENDERR	0.804	1.335	24.000	496.589	0.134	0.053	0.884
EDUCRDOC * GENDERR	0.959	1.011(b)	6.000	142.000	0.420	0.041	0.390

FDPUSE5N = Professional Development/MET Implementation Level
GENDERR = Gender
EDUCRDOC = Educational Level
DIVISAR = Academic Unit/School
YRSITRR = Years of Teaching at ITESM
EMPLOYRR = Work Status

Table D3. Barrier Descriptive Statistics

Barrier Factors	N	Range	Mean	Standard Deviation
Monitor Implementation	276	4.00	3.2138	1.21189
Top-Down Leadership	280	4.00	3.7402	0.92440
Students' Adaptation to Change	278	4.00	3.5321	1.14476
Infrastructure Operational Problems	278	4.00	3.5594	0.99325
Time	278	4.00	3.3700	0.98544
Administrative Alignment & Support	278	4.00	3.5495	1.02868
Support Shortcomings	278	4.00	3.0026	1.00526
Faculty Issues	278	4.00	2.8597	0.97076
Valid N (listwise)	275			

Table D4. Barrier Multivariate Tests

Effect	Wilk's Lambda Value	F	Hypothesis df	Error df	Sig.	Partial Eta. ^{2}	Observed Power (a)
Intercept	0.289	47.725(b)	8.000	155.000	0.000	0.711	1.000
DIVISAR	0.838	1.181	24.000	450.148	0.253	0.057	0.876
EMPLOYRR	0.954	0.945(b)	8.000	155.000	0.482	0.046	0.429
FDPUSE5N	0.834	0.901	32.000	573.207	0.626	0.044	0.807
GENDERR	0.927	1.516(b)	8.000	155.000	0.156	0.073	0.664
YRSITRR	0.869	0.934	24.000	450.148	0.556	0.046	0.758
EDUCRDOC	0.934	1.372(b)	8.000	155.000	0.213	0.066	0.611
DIVISAR * EMPLOYRR	0.865	0.965	24.000	450.148	0.512	0.047	0.776
DIVISAR * FDPUSE5N	0.565	0.971	96.000	1054.404	0.561	0.069	0.993
DIVISAR * GENDERR	0.867	0.943	24.000	450.148	0.543	0.046	0.763
DIVISAR * YRSITRR	0.622	1.071	72.000	950.408	0.326	0.058	0.974
DIVISAR * DUCRDOC	0.863	0.976	24.000	450.148	0.497	0.048	0.782
DIVISAR * YRSITRR	0.622	1.071	72.000	950.408	0.326	0.058	0.974
DIVISAR * DUCRDOC	0.863	0.976	24.000	450.148	0.497	0.048	0.782
EMPLOYRR * FDPUSE5N	0.743	1.504	32.000	573.207	**0.039**	0.072	0.980
EMPLOYRR * GENDERR	0.933	1.397(b)	8.000	155.000	0.202	0.067	0.620
EMPLOYRR * YRSITRR	0.846	1.112	24.000	450.148	0.326	0.054	0.849
EMPLOYRR * EDUCRDOC	0.938	1.279(b)	8.000	155.000	0.258	0.062	0.574
FDPUSE5N * GENDERR	0.862	0.738	32.000	573.207	0.853	0.037	0.692
FDPUSE5N * YRSITRR	0.592	0.888	96.000	1054.404	0.769	0.063	0.986
FDPUSE5N * EDUCRDOC	0.827	0.949	32.000	573.207	0.550	0.046	0.834
GENDERR * YRSITRR	0.823	1.300	24.000	450.148	0.157	0.063	0.913
GENDERR * EDUCRDOC	0.968	0.641(b)	8.000	155.000	0.742	0.032	0.289
YRSITRR * EDUCRDOC	0.911	0.614	24.000	450.148	0.925	0.031	0.517

FDPUSE5N = Professional Development/MET Implementation Level
GENDERR = Gender
EDUCRDOC = Educational Level
DIVISAR = Academic Unit/School
YRSITRR = Years of Teaching at ITESM
EMPLOYRR = Work Status

Table D5. Leadership Intervention Descriptive Statistics

Leadership Intervention Factors	N	Minimum	Maximum	Mean	Standard Deviation
Time and Resources for Professional Development	256	1.00	5.00	2.5632	1.09883
Monitoring Progress	256	1.00	5.00	1.9518	0.97006
Ongoing Support/Coaching	256	1.00	4.43	2.2708	0.89397
Providing Resources and Arrangements	256	1.00	5.00	3.2480	1.01717
Supportive Change Culture	256	1.00	5.00	2.8366	1.02618
Continuous Communication	256	1.00	5.00	2.2448	0.98567
Valid N (listwise)	256				

Table D6. Leadership Interventions Multivariate Tests

Effect	Wilk's Lambda Value	F	Hypothesis df	Error df	Sig.	Observed Power (a)
Intercept	0.290	58.035	6.000	142.000	0.000	1.000
EMPLOYRR	0.914	2.233	6.000	142.000	**0.043**	0.771
DIVISAR	0.880	1.035	18.000	402.122	0.418	0.705
YRSITRR	0.902	0.830	18.000	402.122	0.665	0.579
FDPUSE5N	0.811	1.277	24.000	496.589	0.172	0.865
EDUCRDOC	0.957	1.073	6.000	142.000	0.382	0.414
GENDERR	0.974	0.634	6.000	142.000	0.703	0.246
EMPLOYRR * DIVISAR	0.876	1.074	18.000	402.122	0.376	0.726
EMPLOYRR * YRSITRR	0.912	0.741	18.000	402.122	0.768	0.518
EMPLOYRR * FDPUSE5N	0.801	1.360	24.000	496.589	0.119	0.892
GENDERR	0.974	0.634	6.000	142.000	0.703	0.246
EMPLOYRR * DIVISAR	0.876	1.074	18.000	402.122	0.376	0.726
EMPLOYRR * YRSITRR	0.912	0.741	18.000	402.122	0.768	0.518
EMPLOYRR * FDPUSE5N	0.801	1.360	24.000	496.589	0.119	0.892
EMPLOYRR * EDUCRDOC	0.953	1.157	6.000	142.000	0.333	0.445
EMPLOYRR * GENDERR	0.953	1.177	6.000	142.000	0.322	0.452
DIVISAR * YRSITRR	0.694	1.003	54.000	728.655	0.471	0.945
DIVISAR* FDPUSE5N	0.541	1.292	72.000	778.368	**0.058**	0.999
DIVISAR * EDUCRDOC	0.883	1.007	18.000	402.122	0.450	0.689
DIVISAR * GENDERR	0.924	0.633	18.000	402.122	0.874	0.439
YRSITRR * FDPUSE5N	0.647	0.902	72.000	778.368	0.704	0.974
YRSITRR * EDUCRDOC	0.780	2.056	18.000	402.122	**0.007**	0.974

(table continues)

Effect	Wilk's Lambda Value	F	Hypothesis df	Error df	Sig.	Observed Power (a)
YRSITRR * GENDERR	0.865	1.179	18.000	402.122	0.275	0.777
FDPUSE5N * EDUCRDOC	0.795	1.410	24.000	496.589	**0.095**	0.905
FDPUSE5N * GENDERR	0.822	1.194	24.000	496.589	0.241	0.834
EDUCRDOC * GENDERR	0.940	1.500	6.000	142.000	0.182	0.567

FDPUSE5N = Professional Development/MET Implementation Level
GENDERR = Gender
EDUCRDOC = Educational Level
DIVISAR = Academic Unit/School
YRSITRR = Years of Teaching at ITESM
EMPLOYRR = Work Status

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Vita

Mr. Enrique González was born to Ernesto González and Josefina Negrete in México City on April 12, 1961. He attended elementary and middle education at a bilingual school, El Colegio del Tepeyac, in Mexico City. He graduated with honors from high school at El Colegio del Tepeyac in 1980, and received ***The Fellow's Class Award.*** Enrique earned a BS degree in Electronic and Communications Engineering from the Monterrey Institute of Technology and Higher Education (ITESM), Monterrey Campus. He earned a master's degree in Manufacturing Systems from the State of Mexico Campus of ITESM in 1989. More recently (1998), he concluded a master's degree in Business Administration (EXMBA) at the University of Texas at Austin. His research work is related to educational systemic change, educational leadership and the infusion of technology in teaching and learning.

Throughout his 19-year professional and academic career at ITESM, Enrique González has served as faculty member and academic administrator, and has received several teaching distinctions and acknowledgments. During a three-year period (1986-1989), he was responsible for the Executive Education Office at the Graduate School of ITESM, offering outreach solutions in different fields. Consequently, he has acquired valuable experience within the industry-academy relationship. He has been invited to lecture in forums, seminars, symposia and workshops in Mexico and abroad.

In 1989, Mr. González was appointed President to the ITESM Graduate School of Business in Guadalajara (the second largest city in Mexico). In 1991, he led the foundation of a new university branch at the above location, expanding the institutional academic scope through high school and various undergraduate programs. In order to contribute to the development of his community, Mr. González co-headed the *State' Regional Development Project: Jalisco 2000* (1993-1994), sponsored by the federal and state governments, the business community, academic institutions, and social organizations. Enrique González was appointed President to the Mexico City Campus of ITESM in 1995. As head of this ITESM flagship campus he has been committed to achieving academic excellence and sustainable growth within the high school, undergraduate and graduate educational levels. He was appointed President to ITESM-Mexico City Southern Region covering three campus of the ITESM System (Veracruz, Cuernavaca, and Mexico City) in 2002. Recently (2004), he was appointed President to the Mexico City Metropolitan Area, covering the Santa Fe campus and the Mexico City campus, along with ITESM Graduate School of Business and ITESM Graduate School of Public Affairs.

Fully bilingual, one of his main goals is to contribute to the development of Mexico through his deep involvement in and strong participation as an educational leader with a global perspective. His interests include strategy, planning, leadership, history, philosophy, and use of technology in education. Married to Mónica and father of María, Carlos Enrique and José Luis, Enrique lives in southern Mexico City. He enjoys reading, writing, practicing sports and traveling abroad.

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